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The Scale



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BACK ISSUES

Issues from 1996 to the present can be downloaded from the following web page:
<http://www.sel.barc.usda.gov/coccoidea/scaleframe.html>

ISSIS-IX

The meeting in Padua, Italy was extraordinary, to say the least. The coccidology community wants to again extend its congratulations and thanks to Giuseppina Pellizzari and her many contributing colleagues for making this meeting so very special. Photographs of the meeting can be viewed at: <http://www.sel.barc.usda.gov/Coccoidea/Padua/destination/FrameSet.htm>

ISSIS-X

We are pleased to announce that the X International Symposium on Scale Insect Studies will be held in Adana, Turkey in April 2004. This city is one of the largest in Turkey and is located along the eastern Mediterranean coast. The Tauros Mountains are situated to the north of the city and a typical Mediterranean Coast line is present to the south. Nearby Cukurove is present between the Seyhan and Ceyhan rivers and it contains some of the most fertile areas in Turkey. It is famous for intensive agricultural production including mainly field crops, maize, cotton, fruit crops, and citrus. In ancient times this area called Kilikya and was of special interest because of its rich soils. April is a great time to visit Adana with the sweet aroma of citrus blossoms permeating the air and mild spring weather. There are four or five flights each day from Istanbul which will make travel plans easy since the Adana airport is close to the meeting site. The symposium will discuss all aspects of Coccidiology including: Systematics, Biology, Scale insect pests, Zoogeography, Biological control, Monitoring. A web page is currently being established. Contacts: Lerzan Erkilic and Mehmet Bora Kaydan
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SCALE INSECT FORUM

This web site continues to flourish. The address is: <http://193.204.185.103/scaleinfo/> scale.htm.
The most recent table of contents is as follows:

Home

- Circulation and notification
- Notes for contributors

This issue topic

News about the publication of the Proceedings of ISSIS-VIII

Topic forum from "The Scale":

- Hemiptera or Homoptera; Coccus, Coccinea or Coccoidea? By Michael Kosztarab
- Category, name and affiliation of Scale insects. By Jan Koteja
- Do we need to change the rank of the higher taxa of scale insects (Hemiptera: Sternorrhyncha: Coccoidea)? By Penny Gullan

Pre-publication area

- On the term describing the post-embryonic development of Diaspididae (Rhynchota Coccoidea). by Francesco Porcelli

Requests

- A request from Masumeh Moghaddam

Image gallery

NEWS FROM AROUND THE WORLD

Editor's Note: If you have news that you would like to have included in the next edition of the Scale, we would be happy to receive it. E-mails are especially appreciated.

Samir A. El-Serwy, Plant Protection Research Institute, Egypt: The following are abstracts of papers that were given in 2001: El- Serwy, S. (2001). Ecology, biology and natural enemies of the red-striped soft scale, *Pulvinaria tenuivalvata* (Newstead) (Hemiptera: Coccidae), a pest of sugarcane in Egypt. [Abstract of presentation at the IX ISSIS, Sep. 2- 8, 2001 in Padua, Italy.] And El- Serwy, S. (2001). Parasitic complex of *Pulvinaria tenuivalvata* (Newstead) in Egypt. [Abstract at the ESA Annual Meeting, Dec. 9- 12, 2001 in San Diego, California, USA.]

Maren Gimpel, Gary Miller, and Dug Miller, Systematic Entomology Laboratory, Maryland, USA: This year the Miller Hotel had visits from Roman Jashenko, Kazakhstan; Demian Kondo, Alabama; Doug Williams, Britian; and Ferenc Kozár, Hungary. ScaleNet continues to make progress; for our part of the armored scales, we are nearly finished with the initial data entry and are working on a manuscript for the smaller families that we hope will be published by Intercept. The primary thrust of the research program has been to complete a book on the economic armored scale of the United States. This project has been underway since 1978, and is a collaborative project with John Davidson from just up the street at the University of

Maryland. We now have a large rough draft of the manuscript and hope to take the missing field photographs in the next few month. Gary and Dug also have completed a couple of papers on invasive soft scales and mealybugs in the United States and a paper on the *Dysmicoccus* mealybugs of the Southeastern U.S. Mike Williams and Gary have put the finishing touches on a paper on adult male soft scales of North America. Doug Williams and Dug finished a paper on some cryptic species of *Antonina* and continue to work on a revision of the armored scales in the genus *Furcaspis*. Penny Gullan, Lyn Cook, and Dug have been working on a book chapter on the gall-inducing scale insects. This project has taken much more time than expected, but has drawn attention to some very interesting scale insects. Collecting this year has been limited to a field trip to Florida with Avas Hamon as the local expert and guide. It was a particularly appealing trip in February when the temperatures in Maryland were around freezing and the temperatures in Florida were in the sixties or seventies. Please don't forget that a species-level inventory of the collection in Beltsville is online for your use.
<http://www.sel.barc.usda.gov/coccoidea/scaleframe.html>.

Penny Gullan, University of California, USA: I've now spent two years living in the USA and working at the University of California in Davis (UCD). 2001 was a busy and fairly productive period. I taught in two new undergraduate courses, one on systematic entomology and the other on biodiversity, and worked on a collaborative project on mealybug bacterial endosymbionts with Drs Paul Baumann and My-Lo Thao of the Microbiology Department at UCD. Paul and My-Lo have sequenced genes from the primary and secondary endosymbionts of a number of mealybug species that I collected/acquired and identified. We recently completed a manuscript on endosymbiont coevolution. A new Ph.D. student, Nam Nguyen, started his studies with me in September 2001. Nam will be working on mealybug phylogenetic systematics using morphological data, but presently is completing lots of coursework. During May, Doug Williams and Dug Miller visited UCD for the last of three visits funded by an NSF Curation grant to the Director of the Bohart Museum of Entomology, Dr. Lynn Kimsey. Doug and Dug continued to assist with sorting of the Ferris-McKenzie scale insect collection, especially identification of slide-mounts and the updating of names of armored scales. At the same time, Ben Normark visited Penny's lab for a week and studied armored scales, did some collecting and presented a seminar on "Phylogeny and alternative genetic systems in scale insects". Ray Gill came to UCD to assist in the coccidological event whenever he could escape administration at the California Department of Food and Agriculture. I had a thoroughly enjoyable time with Doug, Dug, Ben and occasionally Ray in my lab, and Bohart Museum scale insect collection benefited greatly too. Another highlight of the year was spending time in Italy to attend the IXth ISSIS in Padua and then to have a short holiday in NE Italy. Peter Cranston, Nam and I all had a wonderful visit and much appreciated the efficient organization and friendly hospitality of Giuseppina Pellizzari and her colleagues and students. The third highlight of the year was the award of a 5-year National Science Foundation (NSF) grant as part of the PEET Program (Partnerships for Enhancing Expertise in Taxonomy) to conduct research and training in phylogenetic systematics of scale insects. For more information, check out: <http://www.nsf.gov/nsf/nsfpubs/nsf9721.htm>. The project is centered at UCD but involves active collaboration with Dug Miller and Ben Normark who will assist me with the training of two graduate students,

several undergraduate students and a postdoctoral researcher. The proposed postdoctoral researcher is already a scale insect fanatic: Takumasa Kondo (Demian to his friends) will need little introduction to those who were at the last ISSIS. Currently Demian is completing a Ph.D. on the New World Myzolecaniinae with Mike Williams at Auburn University and hopes to move to Davis later in 2002 to study SE Asian and Australasian Myzolecaniinae. In late December 2001 and early January 2002, I did fieldwork in southern Africa in conjunction with the field studies of Peter Cranston. Scale insect collecting was fairly sparse but I did find a few interesting things, especially some gall-inducing *Grewiacoccus* mealybugs on a small *Grewia* tree in Zimbabwe, and other mealybugs on the bizarre desert-living gymnosperm *Welwitschia mirabilis*. From January 15-18, 2002, I attended the Third International Symposium on "The Biology of Gall-Inducing Arthropods", held at the University of Stellenbosch, South Africa (organized by Schalk Louw, Jan Giliomee and their colleagues). There I presented the only talk on scale insects in collaboration with Jan Giliomee and Chris Hodgson on the South African gall-inducing *Calycicoccus merwei* (Eriococcidae), and a poster on *Apiomorpha* with Lyn Cook. During the symposium I was shocked and very saddened to learn of the death of our dear colleague Salvatore Marotta. From Africa I travelled on to Canberra, Australia, where I collaborated with Lyn Cook in my former department of Botany & Zoology at the Australian National University. Lyn and I worked on two manuscripts: one is a book chapter on gall-inducing scale insects (also co-authored with Dug Miller) and the other is a paper on the relationships of gall-inducing eriococcid scales as estimated from molecular data. When my departure day of February 6th arrived I was reluctant to leave Canberra and return to the end of a Californian winter (although Californian winters can hardly be called winters). Since my return, I've been kept very busy trying to complete my parts of that chapter on gall-inducing coccoids and recently organizing a symposium on the Phylogeny and Evolution of Sternorrhyncha for the next Annual Entomological Society of America (ESA) meeting to be held at Fort Lauderdale in Florida in November this year. See http://www.entsoc.org/annual_meeting/2002 for details of the Annual ESA meeting, although details of the Sternorrhyncha symposium are not yet available. There's one thing about which you can be certain concerning the symposium -- the Sternorrhyncha will be a treated as a suborder of the order Hemiptera!

Avas Hamon, Department of Plant Industry, Gainesville, Florida, USA and Bill Howard, University of Florida, Ft. Lauderdale, USA: Insect pests are being spread from country to country at an increasing rate. In 1977, when Professor Sadao Takagi of the University of Hokkaido University, described *Aulacaspis yasumatsui*, an armored scale insect collected from cycads (Cycadales) in Thailand, he would not have expected that this species would become highly familiar to residents of Florida, USA, half a world away. But almost 20 years later (1996), this scale insect was found to have been accidentally introduced into the Miami area. Only species of the order Cycadales are known to be hosts, and the insect shows a definite preference for species of the genus *Cycas*. Since first discovered, it has spread widely in southern Florida, has been reported as far north as Tallahassee, and in several islands of the Caribbean. It was found in Hawaii shortly after being found in Florida. This scale insect always kills the host plant if not controlled. A small beetle, *Cybocephalus binotatus*, and a tiny parasitic wasp, *Cocobius fulvus*, were collected in Thailand by Dr. Richard Baranowski of the University of Florida and

released in the Miami area as biological control agents of this scale insect pest. These natural enemies have spread widely on their own in southern Florida and generally suppress its populations. We have also identified several insecticides that control this scale. Horticultural oils are particularly effective, and seem to cause a minimum of disruption to the natural enemies. In January 2002, specimens of a second eastern hemisphere species of the same genus, *A. tubercularis* Newstead, known as the white mango scale, was discovered on a mango in the Miami area. Surveys have located additional specimens in nearby areas. Thus, it is considered established in Florida. The lac insects, family Kerriidae, are native to the eastern hemisphere, and recently, *Paratachardina lobata lobata* (Chamberlin) was found in southern Florida. This insect was first detected here in 1999 on a single *Hibiscus rosa-sinensis*. The plant was destroyed in an attempt to eradicate the insect. However, the scale was again found in March 2000, and is currently reported throughout southeastern Florida. In this region, *Bucida buceras*, *Chrysobalanus icaco*, *Conocarpus erectus*, *Ficus* spp., *Hibiscus*, *Myrica cerifera*, and *Quercus geminata* are frequent hosts of this insect, but data on its host relations is preliminary. We are currently planning studies of the biology and control of this insect. In November 2001, the Diaspididae, *Duplachionaspis divergens* (Green) was discovered in widely separated areas of Florida. Future plans for this scale are still under review and evaluation. The known hosts are all in the Poaceae. Reference: Howard, FW., A. Hamon, T. M. McLaughlin, T. Weissling, and Si-Lin Yang. 1999. *Aulacaspis yasumatsui* (Hemiptera: Sternorrhyncha: Diaspididae), a scale insect pest of cycads recently introduced into Florida. Florida Entomologist 82 (1): 14-27

Takumasa Kondo (Demian), Department of Entomology and Plant Pathology, Auburn University, Alabama, USA. I am trying to finish my dissertation (Ph.D. thesis) on a taxonomic review of the subfamily Myzolecaniinae (Hemiptera: Coccidae). This group is very interesting because they are closely associated with ants and have become so adapted to this symbiotic way of life that many morphological characters are reduced or entirely absent, i.e. legs and antennae. The Myzolecaniinae has a worldwide distribution, however I am noticing many morphological differences between New World and Old World taxa, especially in the crawler stage or first instar nymphs. Usually New World Myzolecaniinae crawlers have 5-segmented antennae in contrast with Old World taxa which have 6 segmented-antennae. Please visit my Soft Scale web-site at: <http://www.auburn.edu/~kondota/scaleinsects.html>.

Michael Kosztarab, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, USA. The following are the highlights of my activities for the past two years. I was fortunate to have had two very busy but fruitful retirement years. In June 2000 we visited Evelyn Danzig in the beautiful Russian city of St. Petersburg. After seeing her workplace in the Zoological Institute Matilda, and I were taken to her lovely home for a tea party. It gave me much pleasure to see my article on the "Status and Future of Human Resources in Coccidology" finally printed in Entomologica (Bari) 33:19-34. During 2001 I also served as coeditor of the 380 page book: A History of the Virginia Academy of Science 1923-2001. I have reviewed a National Science Foundation grant proposal for coccidological research and a number of manuscripts for the ISSIS-IX event in Padua, Italy; and assisted the organizers for a few days, made a presentation and lead discussions at one of the sessions. Last December I attended the

Entomological Society of America (ESA) Annual meeting and the Entomological Collections Network sessions in San Diego, California. There were several oral and poster presentations given on research with scale insects. Besides Ray Gill and Mike Williams, two Russian chalcid wasp experts, S.N. Myartseva ad V.A. Triapitsyn also attended the meetings. Apparently there were sufficient papers/posters on scales and other Sternorrhyncha research to qualify for an informal or formal session. Therefore, I was pleased to learn recently that a formal Sternorrhyncha Section A Symposium is planned for the November 2002 ESA national meeting in Fort Lauderdale, Florida by Penny Gullan. It is sad for a professor to learn that some of his former graduate students are reaching retirement, as it was with James O. Howell last year and will be with Avas B. Hamon this year. Last December we were all saddened to learn about the passing away, after a prolonged illness, our colleague and dear friend Salvatore Marotta. On the bright side I have learned that Dug Miller is the recipient of the L. O. Howard Lifetime Achievement Award at the Eastern Branch of ESA in 2002. Congratulations to Dug from our worldwide coccidologist community for receiving this well-earned recognition! It looks good for coccidology, especially since he is the second scale insect specialist in two years to be honored with this award. [editor's note; Michael received the award for 2001]. Some of you may also recall that in 2000 the ESA President's Award for a High School teacher successfully using insects in a class project was given for a cochineal scale project to Ms. Michelle Leddell of Santa Monica, California. So, national recognition for coccidological work has been received for three consecutive years. Let's keep up with this good start!

Ferenc Kozár, Plant Protection Institute, Budapest, Hungary: I am sorry to report that I have not yet had the opportunity to finish the monograph on the Ortheziidae. However, it is near completion and will be in press soon. Because of my obligation to support my research program with grant funds, I have begun working on a project on the mealybug genus *Rhizoecus*. Based on extensive samples collected in Berlese samples from many parts of the world, I have discovered about 15 new species of the genus. Surprisingly, some of them are quite interesting. I am currently studying the types and unidentified material from several of the major museums. In fact, this note is written in Beltsville, Maryland where I am studying the extensive *Rhizoecus* material in the collection of the U.S. National Museum of Natural History. I also am enjoying my stay in the Miller Hotel. If you have material of *Rhizoecus* that you think should be included in this study, please contact me as soon as possible.

Jon Martin, The Natural History Museum, England: He writes that he is still curator of the Natural History Museum's scale insect collection. With a large amount of pseudococcid material due for imminent reincorporation into the collection, following Doug Williams's study on the mealybugs of south-east Asia, that section will require substantial expansion. The mealybugs will shortly occupy a third 20-drawer cabinet of their own, which will give space for the collection to expand to over 40,000 slides. Jon's main research interest remains whiteflies, but his field collecting always also targets scales of many families, and has led to acquisition of many interesting taxa, usually treated in papers by specialist coccidologists. The most recent field collections have been from Australia, Hong Kong and Singapore, and a month-long visit to Belize is planned for 2002.

Ian Millar, National Collection of Insects, Pretoria, South Africa: I have been collaborating with Chris Hodgson (National Museum of Wales, Cardiff, U.K.) on a study of several interesting new species of South African Aclerdidae. This project has resulted in the description of a new subfamily, two new genera and three new species from southern Africa, and a phylogenetic analysis of the Aclerdidae. The work will be published, with Chris as senior author, in Systematic Entomology (the final manuscript was accepted in January this year for publication). In another project, I have compiled a key to the 50 genera of mealybugs that are known to occur in South Africa. The manuscript was reviewed last year, and is currently awaiting publication in African Entomology, the journal of the Entomological Society of Southern Africa. Lastly, I am editing a computer database of specimen information associated with the 6700 Coccoidea accessions in our collection. The database will enable searching of the collection's data by category, such as locality or host plant.

R. K. Varshney, Aligarh, India: I would like to draw attention to a relatively new journal that I have started. It is called Bionotes and is a quarterly newsletter that is in its fourth year. It is an outlet for short notes not exceeding four pages.

Douglas J. Williams, The Natural History Museum, Britian: Continues toward his goal of finishing his book on the mealybugs of southern Asia. The illustrations are nearly complete (just a few more *Pseudococcus* to do) and he is more than 3/4 of the way through the descriptions. He did the usual jaunt to Beltsville, Maryland and Davis, California in the spring of 2001 and is especially grateful to Penny Gullan and Peter Cranston for allowing him to stay in their beautiful house in the foothills during his visit there. He also completed a small paper with Dug Miller on the mealybug genus *Antonina*. He has numerous other projects either in press or near completion, but it is hard to keep track of all of them because there are so many.

NECROLOGY

It is particularly sad to announce the death of Salvatore Marotta. The short announcement from Giuseppina says it all. I am very sad to inform you that our dear friend and colleague Salvatore Marotta passed away on December 18, 2001. Those who were privileged to know him were very much aware of his generous nature, his kindness and goodness of heart, and his high level of scientific achievement and productivity. A quick analysis of his coccidology career as compiled by ScaleNet shows that he published 43 papers with the first appearing in 1983. His interests were highly diverse including invasive species, life history, morphology, nomenclature, systematics, and zoogeography to name a few. He was interested in all groups of scale insects but published papers that focused on Coccidae, Dactylopiidae, Diaspididae, Eriococcidae, Kermesidae, Margarodidae, Micrococcidae, Pseudococcidae, and Putoidae. Salvatore was a delightful human being who had a wonderful sense of humor. His enthusiasm and excitement for scale insect research was truly contagious. You couldn't talk with him for even a few minutes without being struck by his intense interest in scale insects. He will be GREATLY MISSED, even by those of us who live on the other side of the world.

RECENT LITERATURE

Compiled by Karen Veilleux

Editors Note: Karen continues to do a truly outstanding job with the scale insect reference file! Without her dedication and careful attention to detail this project would be of much lower quality. I also wish to thank Michael Kosztarab, who spends time each year proofing the manuscript before it is “printed” in The Scale.

During the previous 12 months I've entered 1757 new records. The total in ScaleNet as of the last upgrade was 16,227. (Last year at this time I had entered 1283 records, and the year before, 790.) We might want to remind people that many of these newly entered titles are older ones that are just being discovered. Anyone who wants to keep track retrospectively of a certain topic or taxa may want to repeat their ScaleNet searches periodically, and not limit their searches to recently published papers.

Results

Abd El-Salam, A. & Mangoud, H. 2001. Development and implementation of integrated pest management to programs of apple trees in reclaimed lands in Egypt: I - The fig scale insect (FSI), *Russellaspis (Asterolecanium) pustulans* (Cockerell). Journal of Agriculture in the Tropics and Subtropics 102(1):33-44. [AbdEISMa2001]

Notes: The fig scale insect (FSI), *Russellaspis (Asterolecanium) pustulans* (Cockerell) (Homoptera: Asterolecaniidae) is a serious pest of apple trees, *Pyrus malus* (Mill), in new reclaimed lands in Egypt. Both nymphs and adult females were found on apple trees all over the year. The distribution studies of the FSI on various parts of apple trees were carried out in a private farm located in El-Mansoria Center at El-Giza Governorate in Egypt. The distribution studies are equally important, particularly when oriented spraying is practiced. The data showed that 51.6 and 46.6% of adults and nymphs stages respectively of the FSI were concentrated on trunks, while, 48.4 and 53.4% respectively were distributed between main branches, new branches and new leaf petioles. The same trend was observed with the distribution of parasites. The FSI population was concentrated in the direction of water pipe in new reclaimed lands. Two methods were carried out to control this pest: the whole tree spraying and the oriented spraying. In the whole tree spraying, the whole tree was sprayed; about 7 liters of pesticide solution at winter time (after pruning) and 15 liters at summer time (before pruning). In the oriented spraying (spraying of infested branches), about 2.5 liter at winter time (after pruning) and 6 liters at summer time (before pruning) spraying solution per tree were sufficient to cover the infested branches. Both spraying methods (oriented and whole tree spraying) gave complete protection for 5 months (in winter) and 4 months (in summer) after which, reinfestation was observed. The whole tree spraying was the more expensive variants (235 and 162 LE/feddan) while the oriented spraying variants (106 and 71 LE/feddan) was relatively safe to the environment and also gave good reduction against the FSI pest and is very important in Integrated Pest Management (IPM) methods.

Abd Rabou, S. 2000. Parasitoids attacking *Saccharicoccus sacchari* (Cockerell) (Hemiptera: Pseudococcidae) on sugarcane in Egypt. 72-75. In: Allsopp, P.G. (Ed.) & Suasa Ard, W., Sugarcane Pest Management in the New Millennium. 4th Sugarcane Entomology Workshop International Society of Sugar Cane International Society of Sugar Cane Technologists, Indooroopilly, Australia. 104 pp. [AbdRab2000]

Notes: Sugarcane mealybug, *Saccharicoccus sacchari* (Cockerell), exerts drastic effects on sugarcane plants and is considered one of the most important pests attacking this plant in Egypt. The present work includes a survey of the parasitoids of this pest and their abundance in locations affected by it. The survey of *S. sacchari* parasitoids and

hyperparasitoids took place during June 1998-June 1999. Nine parasitoids and hyperparasitoids were recorded. These are *Anagyrus greeni* Howard, *A. pseudococcii* (Girault), *Chartocerus subaenus* (Foerster), *Leptomastidea abnormis* (Girault), *Microterys* sp., *Paraphaenaodiscus* sp., *Prochiloneurus* sp., *Rhopus nigriclavus* (Girault) and *Rhopus* sp. Abundance of these species was evaluated at three localities in Egypt. *L. abnormis* was the dominant parasitoid, showing maximum parasitism rates of 14 and 21% during October 1998 in Assiut and Qena governorates, respectively, while at the third locality it was not active. From these results, it is clear that there is an urgent need for introduction of other effective parasitoids from abroad to achieve effective control of this pest.

Abd-Rabou, S. 2001 (1999). Parasitoids attacking the Mediterranean black scale, *Saissetia oleae* (Hemiptera: Coccidae) on olive in Egypt. *Entomologica* 33 (1999): 169-172. [AbdRab2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Saissetia oleae* is an important pest of olive trees in Egypt. A survey of the parasitoids of *S. oleae* was carried out monthly between April 1995 and March 1997 in three different locations in Egypt. Five species of Encyrtidae, a species of Pteromalidae and an aphelinid hyperparasite were found. Three of these records were new for Egypt.

Abd-Rabou, S. 2001a (1999). An annotated list of the Hymenopterous parasitoids of the Diaspididae (Hemiptera: coccoidea) in Egypt, with new records. *Entomologica* 33: 173-177. [AbdRab2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Eighteen species of hymenopterous parasitoid of armoured scale insects (Hemiptera: Diaspididae) were recorded in a survey of host plants in three locations in Egypt during 1994-1997. The 16 species of Aphelinidae and two Encyrtidae are listed, along with their diaspidid hosts and location in Egypt; ten species were new records for Egypt.

Abd-Rabou, S., Hanafi, A. & Hussein, N. 2001 (1999). Notes on the parasitoids of the soft brown scale, *Coccus hesperidum* (Hemiptera: Coccidae) in Egypt. *Entomologica* 33(1999): 179-184. [AbdRabHaHu2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Thirteen species of hymenopterous parasitoids were found in association with *Coccus hesperidum* at three locations in Egypt: 4 species of Aphelinidae (of which three were recorded for the first time); seven species of Encyrtidae (of which three were recorded for the first time), the first record of a species of Mymaridae, plus a species of Pteromalidae. The relative abundance of these parasitoids is discussed.

Abdel-Salam, A.H. & Abdel-Baky, N.F. 2001. Life table and biological studies of *Harmonia axyridis* Pallas (Col., Coccinellidae) reared on the grain moth eggs of *Sitotroga cerealella* Olivier (Lep., Gelechiidae). *Journal of Applied Entomology* 125(8): 455-462. [AbdelSAb2001]

Notes: The developmental period of immature stages, survival per cent, longevity, fecundity and life table parameters of *Harmonia axyridis* by feeding on fresh and frozen grain moth eggs (GME) of *Sitotroga cerealella* were studied under laboratory conditions. The effect of crowding adults on fecundity of females was also determined. The total developmental time from egg hatching to adult eclosion ranged from 18.89 +/- 0.32 to 22.5 +/- 0.21 days on fresh and frozen GME, respectively. Survival per cent from egg hatching to adult emergence differed significantly when the predator fed on the two diets of GME. Also, pupal and adult weights were affected by feeding on fresh and frozen GME. There were no significant differences in longevity of females, while there were significant variations in fecundity of females and longevity of males. The calculated values of T, DT, R-o, r(m), and e(rm) were high by feeding on fresh GME. Moreover, rates of survivorship (Lx), and maximum oviposition per female per day (Mx) were higher when the predator was reared on fresh than on frozen GME. Crowding conditions of predator adults affected the fecundity of females due to egg cannibalism by both males and females of the predator. [Keyword: Margarodidae]

Abdrashitova, N. 2001 (1999). Dendrophilous Coccoids (Hemiptera: Coccoidea) of the walnut-fruit forest area of Kyrgyzstan. *Entomologica* 33 (1999): 229. [Abdras2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. A study of dendrophilous coccoid fauna of the walnut-fruit

forest area of southern Kyrgyzstan (the Fergana and Chatkal mountain ranges) was undertaken. Forty-five coccoid species were discovered belonging to 27 genera and 6 families: Diaspididae (9 genera, 18 species), Coccidae (9 genera, 15 species), Pseudococcidae (6 genera, 9 species) and Margarodidae, Eriococcidae and Ortheziidae (1 species each). The scale insect fauna contains 9 species that are basically from Central Asia (20%) and 14 species which are subendemic to the Iranian and Turanian regions (31%). The rest of the species are Mediterranean (7 spp., 16%), European (2 spp., 5%), Palaearctic (4 spp., 9%) and Holarctic (3 spp., 7%). The complex of accidental species includes 6 species (13.5%). These scale species could be referred to three groups: polyphagous - 24 species (53.3%), oligophagous - 18 species (40%) and monophagous - 3 species (6.7%). In addition, on the basis of their frequency and damage, 10 species were categorised as numerous, 21 species as moderately numerous and 14 species as rare or infrequent. The most numerous and economically important species was *Sphaerolecanium prunastri* (Fonsc.), which caused extensive damage to the local alycha species (*Prunus sogdiana* Vass.). In these areas of Kyrgyzstan, biological control of the scale insect fauna is considered the most appropriate and promising method and such encyrtid parasitoids as *Discodes coccophagus* Ratz. and *Microterys hortulanus* Erd. play an important role in the control of *S. prunastri*.

Abdul, N.H. 2000. [Saissetia oleae (Bernard), occasional scale of Lebanon cedar (Hemiptera, Coccoidea, Lecanidae).] *Saissetia oleae* (Bernard), cochenille occasionnelle du Cedre au Liban (Hemiptera, Coccoidea, Lecanidae). (In French). Nouvelle Revue d'Entomologie 17(1): 81-82. [Abdul2000]

Notes: Individuals of *Saissetia oleae* were found on Lebanon cedar (*Cedrus libani*) in the region of Jbeil, Byblos, at 500 m altitude.

Abou-Elkhair, S. 2001 (1999). Scale insects (Hemiptera: Coccoidea) and their parasitoids on ornamental plants in Alexandria, Egypt. Entomologica 33 (1999): 185-195. [AbouEl2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] This paper discusses the scale insects (Coccoidea) and their parasitoids on ornamental plants in the Alexandria district of Egypt, between 1995 and 1998. Thirty-nine coccoid species belonging to eight families were noted: Asterolecaniidae, Coccidae, Diaspididae, Eriococcidae, Margarodidae, Ortheziidae, Phoenicococcidae and Pseudococcidae. Twelve genera of Hymenoptera belonging to five families were recorded as parasitoids: Aphelinidae (*Aphytis, Coccophagus* and *Encarsia*); Encyrtidae (*Anagyrus, Arrhenophagus, Gyranusoidea, Habrolepis, Metaphycus* and *Rhopus*); Eulophidae (*Aprostocetus*); Pteromalidae (*Scutellista*) and Signiphoridae (*Signiphora*). Four endoparasitoids were recorded from Egypt for the first time: *Arrhenophagus* sp. and *Gyranusoidea litura* Prinsloo (Encyrtidae), *Aprostocetus* sp. (Eulophidae) and *Signiphora fax* Girault (Signiphoridae).

Addison, P. & Samways, M.J. 2000. A survey of ants (Hymenoptera: Formicidae) that forage in vineyards in the Western Cape Province, South Africa. African Entomology 8(2): 251-260. [AddisoSa2000]

Notes: This study was undertaken to establish which species of ants were associated with the mealybug *Planococcus ficus* (Signoret) (Hemiptera: Pseudococcidae), and which species were dominant in the main vine-growing areas of the Western Cape Province, South Africa. During 1998/99, 22 vineyards were surveyed in the Stellenbosch/Paarl, Little Karoo, Worcester, Swartland, Olifants River and Hex River Valley regions, using pitfall traps to sample epigaeic ants and tuna-bait traps to sample arboreal ants. Each vineyard was sampled intensively for two consecutive weeks shortly before harvest. Forty two species of ants were recorded during the survey. The most widely distributed ant species, which were potentially dominant and associated with mealybug outbreaks in vineyards in the Western Cape Province, were *Anoplolepis custodiens* (F. Smith), *A. steingroeveri* (Forel) and *Linepithema humile* (Mayrn). *Crematogaster peringueyi* Emery, *Crematogaster* sp. 2 and *C. melanogaster* Emery are three arboreal species potentially dominant in vines only. Dominance indices for *Pheidole* sp. 1 and *Pheidole* sp. 2 were low compared to the more aggressive *Anoplolepis* spp. and *L. humile*, indicating that the former two species were not of economic significance. Edge effects occurred in five of the surveyed vineyards for three ant species. These edge effects indicate specific preferences of the ants for certain abiotic and microclimatic factors in vineyards, but could also be the result of interspecific competition.

Alencar, J.A. de 2000. [Potential pests present in the irrigated dwarf cocoa agroecosystem in the Sao Francisco valley.] Pragas potenciais presentes no agroecossistema do coqueiro anão irrigado no submedio do vale do Sao Francisco. (In Portuguese). Documentos da Embrapa Semi Arido No. 152: 12 pp. [Alenca2000]

Notes: Notes are given on potential arthropod pests of dwarf cocoa in Petrolina, Brazil. The pests considered are: *Aspidiotus destructor*, *Hyalospila ptychis*, Tetranychidae and Eriophyidae.

Allsopp, P.G. & Hogarth, D.M. 2001. I think pink ground pearls might be feeding on my crop -- what can I do? Proceedings of the 2001 Conference of the Australian Society of Sugar Cane Technologists 199-203. [AllsopHo2001]

Notes: [Conference held at Mackay, Queensland, Au 2001.] The morphology (at different developmental stages), development, and reproduction of pink ground pearl (*Eumargarodes laingi*) are reviewed. Use of the proper insecticide or cultural control mechanisms (varying length of crop cycle, fallowing, cultivation and alternative crops), resistant sugarcane cultivars; and observation of proper farm hygiene to reduce/eradicate this pest are presented. Combinations of the aforementioned practices for integrated pest management, and different strategies for various soil types are described.

Allsopp, P.G. (Ed.) & Suasa Ard, W. 2000. In: , Sugarcane Pest Management in the New Millennium. 4th Sugarcane Entomology Workshop International Society of Sugar Cane. International Society of Sugar Cane Technologists, Indooroopilly, Australia. 104 pp. [AllsopSu2000]

Notes: Thirteen papers were presented at this Workshop, under the headings: biological control of sugarcane borers; chemical and host-plant resistance for control of borers; integrated control of borers; biotechnology; biological control of sucking insects; control of whitegrubs; economic injury levels; and pest faunas and incursion management. Scale species discussed include *Aulacaspis tegalensis*, *Ceroplastes destructor*, *Planococcus citri*, *Pseudococcus maritimus* and *Saccharicoccus sacchari*.

Allsopp, P.G., FitzGibbon, F. & DeBarro, P.J. 2000. Development of a Pest Risk Analysis and a Pest Incursion Management Plan for the Australian Sugar Industry. 96-103 In: Allsopp, P.G. (Ed.) & Suasa Ard, W., Sugarcane Pest Management in the New Millennium. 4th Sugarcane Entomology Workshop International Society of Sugar Cane International Society of Sugar Cane Technologists, Indooroopilly, Australia. 104 pp. [AllsopFiDe2000]

Notes: A Pest Risk Analysis (PRA) undertaken for the Australian sugar industry identified 1286 species of insects and mites associated with sugarcane throughout the world. In areas to the north of Australia (Papua New Guinea, Indonesia, Malaysia, Thailand and Philippines) more than 400 potential pest species were identified, including two scale insects. We also developed a Pest Incursion Management Plan (PIMP) that complements the PRA database, and covers both incursions into commercial cropping areas and into back-yard plots of sugarcane.

Alvarez, R.C. 2001. Program for rubber. Greenfields (Philippines) p. 23-27. [Alvare2001]

Notes: The occurrence of Pseudococcidae and pest control is among the topics discussed here.

Amin, A.H., Risk Madiha, A. & Sakr, H.E.A. 2001 (1999). Factors responsible for the extinction of *Chrysomphalus aonidum* (L.) from citrus orchards in Egypt. Entomologica 33(1999): 441. [AminRiSa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Ecological studies have shown that the black armoured scale, *Chrysomphalus aonidum* (L.), has four overlapping annual generations on navel orange trees under conditions in Qalyubia Governorate, Egypt. Five species of natural enemies were recorded on *C. aonidum* during the present work. The ectoparasitoid, *Aphytis holoxanthus* DeBach, was recorded for the first time from Egypt, and the other bioagents were three endoparasitoids: *Aspidiotiphagus citrinus* Craw., *A. lounsburyi* Berl. & Paoli and *Habrolepis pascuorum* Mercet and an entomogenous fungus, *Cladosporium cladosporides* (Fresen). Recently, *C. aonidum* appears to have become extinct in citrus orchards in many localities in Egypt. It is considered that this is due to a combination of spray timing and the effects of these five bioagents. Since 1967, the Ministry of Agriculture in Egypt has recommended the use of summer sprays against this pest, instead of autumn and winter applications. Summer sprays are less harmful to these natural enemies, which are mainly effective against the winter and spring populations of *C. aonidum*.

Arai, T. 2001. Effects of simulated rainfall on the survival of *Pseudococcus cryptus* Hempel (Homoptera: Pseudococcidae). Bulletin of the National Institute of Fruit Tree Science (35): 109-114. [Arai2001]

Notes: Potted citrus trees infested with *Pseudococcus cryptus* were exposed to simulated rainfall to clarify its effect on the survival of this pest species. The rainfall did not affect the survival rates of the insects. The addition of wind at a rate of 2m/s to the rainfall enhanced the mortality of the first instar nymphs. The intensity and duration of rainfall with wind affected the survival of the first instar nymphs. However, the survival of the second instar nymphs did not change by those treatments.

Aung, L.H., Leesch, J.G., Jenner, J.F. & Grafton Cardwell, E.E. 2001. Effects of carbonyl sulfide, methyl iodide, and sulfuryl fluoride on fruit phytotoxicity and insect mortality. *Annals of Applied Biology* 139(1): 93-100. [AungLeJe2001]

Notes: Three potential chemical fumigants, carbonyl sulfide (COS), methyl iodide (MI) and sulfuryl fluoride (SF), were tested at selected dosages on lemons (cv. Eureka) against California red scale (*Aonidiella aurantii*), and MI and COS were tested on nectarines (cv. Summer Bright) against codling moth (*Cydia pomonella*). SF at ≥ 40 mg litre $^{-1}$ gave 100% red scale mortality but resulted in commodity phytotoxicity. Lemons treated with the highest selected dose of 80 mg litre $^{-1}$ COS gave only 87% kill of red scale, but failed to reach the desired probit 9 level.

Aytas, M., Yumruktepe, R. & Mart, C. 2001. [Using pheromone traps to control California Red Scale *Aonidiella aurantii* (Maskell) (Hom.: Diaspididae) in the Eastern Mediterranean region.] (In Turkish; Summary In English). *Turkish Journal of Agriculture and Forestry* 25(2): 97-110. [AytasYuMa2001]

Notes: [Original title: Dogu akdeniz bolgesi'nde turuncillerde zararli Kirmizi kabuklubit, *Aonidiella aurantii* (Maskell) (Hom.: Diaspididae) mucadelesinin yonlendirilmesinde eseysel tuzaklardan yararlanma olanaklari.] In this study, the possibility of using pheromone traps against California red scale (CRS), *Aonidiella aurantii*, the main pest of citrus fruits, was examined. In 1995 and 1996, the male flight periods and four peak points were determined. There was a significant correlation between numbers of trapped males and leaf/fruit CRS populations. Mass trapping was not found to be a promising method for CRS control based on effectiveness and costs.

Bajwa, G.A. & Gul, H. 2000. Some observations on insect species of *Paulownia* species at Pakistan Forest Institute Campus, Peshawar. *Pakistan Journal of Forestry* 50(1-2): 71-80. [BajwaGu2000]

Notes: Exotic *Paulownia*, fast growing tree species of Chinese origin, were introduced in different ecological zones of Pakistan. Studies conducted by recording the observations fortnightly on nurseries and plantations at the Pakistan Forest Institute Campus, Peshawar, showed that the *Paulownia* spp. (*P. elongata*, *P. fargesii*, *P. fortunei*, *P. kawakamii*, *P. tomentosa*) were attacked by fourteen insect species, including *Drosicha stebbingii* (Margarodidae). *D. stebbingii* appeared in epidemic form on *Paulownia tomentosa* and *P. fortunei*. The pest was managed by adopting an integrated control strategy in which practices such as destruction of eggs by soil working, banding of tree trunks and application of insecticides were combined together. All components of the integrated control strategy proved effective. Among the chemicals Bullock 25EC [beta-cyfluthrin], Mepra 50EC and Endon 35EC at 0.2% were the most effective insecticides against the pest.

Balikai, R.A. & Bagali, A.N. 2000. Population density of mealybug, *Maconellicoccus hirsutus* (Green) on ber (*Zizyphus mauritiana* Lamarck) and economic losses. *Agricultural Science Digest* 20(1): 62-63. [BalikaBa2000]

Notes: Studies were carried out in Bijapur, India, in 1998 to assess the population density of *M. hirsutus* on ber and economic losses sustained. On an average there were 80.6 colonies per plant, each colony having 17.8 individuals. Similarly 15.4 egg masses covered with white waxy mealy matter were observed per plant, each egg mass containing 90.7 orange coloured oval shaped eggs. Based on the market price of infested and healthy fruits, there was a net monetary loss of Rs. 25,800/ha accounting for 33.33 per cent loss due to mealybug infestation.

Barbagallo, S. 2000. Ricordo di Vincenzo Lupo (1908-1999). (In Italian). *Atti dell'Accademia Nazionale Italiana di Entomologia* 48: 67-80. [Barbag2000]

Notes: Biography and list of publications of Vincenzo Lupo (1908-1999).

Barzman, M.S. & Daane, K.M. 2001. Host-handling behaviours in parasitoids of the black scale: a case for ant-mediated evolution. *Journal of Animal Ecology* 70(2): 237-247. [BarzmaDa2001]

Notes: 1. We hypothesize that differences in host-handling times among three closely related encyrtid parasitoids (*Metaphycus annekei* Guerrieri & Noyes, *Metaphycus hageni* Daane & Caltagirone and *Metaphycus lounsburyi* [Howard]) are influenced by the defenses of their host, black scale (*Saissetia oleae* [Olivier]). Two forms of host defense were examined: (i) the scale's possession of a hard integument, and (ii) the effect of ants tending *S. oleae*. 2. Duration of host assessment, host rejection, drilling/oviposition and the presence or absence of host feeding were measured for *M. annekei*, *M. hageni* and *M. lounsburyi*. Results show that *M. annekei* oviposits through the soft ventral integument while *M. hageni* and *M. lounsburyi* oviposit through the harder dorsal integument. *M. annekei* was never observed to host feed while both *M. hageni* and *M. lounsburyi* use hosts for either oviposition or host feeding. The ventral drilling location and absence of non-concurrent host feeding significantly reduced the overall host-handling time of *M. annekei*, relative to *M. lounsburyi* and *M. hageni*. 3. Oviposition success of *M. annekei* and *M. hageni* in the presence of ants was compared. An observation arena was established with the numbers of Argentine ants, *Linepithema humile* (Mayr) and *S. oleae* manipulated on potted oleanders. *M. hageni* and *M. annekei* were placed, individually, onto the observation arena and their interaction with ants and *S. oleae* recorded. While 55 times 3% of *M. annekei* successfully oviposited, *M. hageni* was unable to oviposit or host feed in the presence of foraging ants. 4. Field tests were conducted using potted oleander plants, infested with *S. oleae*, to determine the effect of *L. humile* on scale density, parasitism levels and parasitoid species composition. Ant-tended plants had significantly more scale, lower scale parasitism and lower levels of host feeding (as indicated by unknown scale mortality levels). There were also significant differences in parasitoid species composition between ant-tended and ant-excluded treatments, with the relative frequency of parasitoid species with faster host-handling times more common in the ant-tended treatment.

Beardsley, J.W. 2001 (1999). *Nipaecoccus nipae* (Maskell) and two apparently undescribed sibling species (Hemiptera: Coccoidea: Pseudococcidae). *Entomologica* 33 (1999): 49-57. [Beardsley2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] This paper argues that there are at least two species belonging to the *Nipaecoccus nipae*-species complex in Hawaii, one with white wax and the other with buff wax. These two species differ in a number of features but perhaps the most important is that the encyrtid parasitoid *Pseudaphycus utilis* Timberlake is only known to parasitize the white-wax species. A brief history of the two species (and another in Florida) is outlined, followed by a discussion of the morphological reasons for believing them separate. The problems of nomenclature are then outlined and it is concluded that the buff-wax species is *Nipaecoccus nipae* (Maskell) and that *N. pseudonipae* (Cockerell) is a synonym. The two other species (i.e. the white-wax species from Hawaii and the species from Florida) are then described as *Nipaecoccus paranipaen*, n. sp. and *Nipaecoccus floridensis*, n.sp. respectively.

Beggs, J. 2001. The ecological consequences of social wasps (*Vespula* spp.) invading an ecosystem that has an abundant carbohydrate resource. *Biological Conservation* 99(1): 17-28. [Beggs2001]

Notes: Introduced *Vespula* wasps have successfully invaded beech (*Nothofagus*) forests in New Zealand. By collecting honeydew, an abundant carbohydrate resource, wasps can reach high numbers. Honeydew is produced by an endemic scale insect that infests about 1 million hectares of land, 15% of New Zealand's remaining native forest. At the peak of the wasp season, honeydew beech forests had an average biomass of about 3.8 kg of introduced wasps ha⁻¹ (10,000 workers ha⁻¹). These abundant invaders reduce the standing crop of honeydew by more than 90% for 5 months of the year and so compete with native species (such as birds and invertebrates) that also consume honeydew. The behaviour of 3 species of native birds is affected by this reduction in honeydew. However, it is unknown whether this affects the survival or reproductive success of these birds. Nevertheless, to avoid altering the birds' behaviour, wasp density should not increase above a level where wasps revisit honeydew threads more than once every 180-400 min. Additionally, the predation rate of wasps on some invertebrate prey species is so high that the probability of an individual surviving through the wasp season is virtually nil. Hence, wasps probably reduce or eradicate populations of some invertebrates. Wasp abundance needs to be reduced by 80-90% to conserve some native invertebrate species. Wasps could also affect nutrient cycling in the honeydew beech forest community by reducing the flow of carbon to microorganisms in the phyllosphere and the soil, which ultimately could affect soil solution chemistry. Current control tools are unable to reduce wasp populations over large tracts of forest. The challenge is to identify and develop new control techniques to achieve widespread control for conservation gains. The impact of introduced social wasps provides a warning of the

damage exotic ants could cause if they were to invade honeydew beech forest. New Zealand needs to be vigilant to reduce the risk of an invasion by ants or other social wasps.

Bekele, T. 2001. Insecticidal screening against enset root mealybug, *Paraputo* spp. AgriTopia 16(2): 2-3. [Bekele2001]
Notes: Enset [*Ensete* sp.] plants infested with root mealybug (*Paraputo* sp.) were treated with different insecticides between the 1997 and 1999 seasons, in Ethiopia. Out of the chemical insecticides tested, Phostoxin tablets and Phyrinex 48% EC resulted in mean pseudostem circumference increases of 23.23 and 32.34 cm, and in mean plant height increases of 71.09 and 58.11 cm, respectively, over the control. Phyrinex 48% EC and Phostoxin tablet provided better control of root mealybug than the other insecticides. Miraculus chalk could not be recommended for enset root mealybug control because of its phytotoxic effect.

Ben-Dov, Y. 2001. [A note on quarantine interceptions of the San Jose scale.] (In Hebrew; Summary In English). Alon Hanotea 55: 141-142. [BenDov2001]

Notes: The San Jose scale, *Quadraspidiotus perniciosus* (Comstock) (Coccoidea: Diaspididae) has been frequently intercepted during 1998-2000 in Israel on commercial importation of apple, pear and quince from Austria, France, Greece, Italy, Turkey and USA (Washington State). The scale does not occur in Israel.

Ben-Dov, Y. 2001a. A new species of *Puto* from oaks in the eastern Mediterranean (Hemiptera, Coccoidea, Pseudococcidae). (In English; Summary In French). Revue Française d'Entomologie 23(1): 105-108. [BenDov2001a]
Notes: The female of *Puto israelensis*, new species, is described and illustrated.

Ben-Dov, Y. 2001b. [Pulvinaria psidii Maskell a new soft scale in Israel.] (In Hebrew; Summary In English). Alon Hanotea 55: 262-263. [BenDov2001b]

Notes: The guava scale, *Pulvinaria psidii*, (Hemiptera: Coccidae: Coccoidea) was found in 1999 for the first time in Israel. Host plants are listed.

Ben-Dov, Y. 2001c. Taxonomy of *Aspidiotus aharonii* Bodenheimer, 1924 (Hem. Coccoidea, Diaspididae) with new synonymy. Entomologist's Monthly Magazine 137: 161. [BenDov2001c]

Notes: *Aspidiotus aharoni* Bodenheimer, 1924, originally described from *Ceratonia siliqua* near Benamina, Israel, is designated as a junior synonym of *Diaspidiotus pyri* Lichtenstein, 1881.

Ben-Dov, Y. 2001d. A new genus and species of soft scales (Hemiptera: Coccoidea: Coccidae) from oaks in Israel. Phytoparasitica 29(5): 400-404. [BenDov2001d]

Notes: A new genus of soft scale, *Kenima*, is described for *Kemina galilit*, a new species recorded on oaks in Israel.

Ben-Dov, Y. & Marotta, S. 2001. Taxonomy and family placement of *Coccus bassi* Targioni Tozzetti, 1867 (Hemiptera: Coccoidea). Phytoparasitica 29(2): 169-170. [BenDovMa2001S]

Notes: *Coccus bassi* Targioni Tozzetti, 1867 is assigned to the Dactylopius in the family Dactylopiidae. Notes are given on its taxonomic features. This species is compared morphologically to *Coccus cacti* (now *Dactylopius coccus*).

Ben-Dov, Y. & Marotta, S. 2001a. Stabilizing the name *Aspidiotus nerii* Bouché, 1833 (Hem., Coccoidea, Diaspididae). Bulletin de la Société Entomologique de France 106(2): 181-191. [BenDovMa2001Sa]

Notes: *Aspidiotus nerii* is placed as the valid synonym for the oleander scale. *Diaspis obliquum* is established as a *nomen oblitum* and a synonym of *A. nerii*.

Ben-Dov, Y. & Matile-Ferrero, D. 2001. On the distribution of *Phenacoccus yerushalmi* Ben-Dov (Hemiptera: Coccoidea: Pseudococcidae) in the Mediterranean Basin. Phytoparasitica 29(2): 167. [BenDovMa2001D]

Notes: This species was first described from Jerusalem, Israel, recorded on *Pinus halepensis*. The mealybug is widely distributed in the Mediterranean basin, but has only been found sporadically.

Ben-Dov, Y., Matile-Ferrero, D. & Gafny, R. 2000. Taxonomy of *Ceroplastes rubens* Maskell with description of a related new species (Hemiptera: Coccoidea: Coccidae) from Reunion, including DNA polymorphism analysis. (In English; Summary In French). Annales de la Société Entomologique de France 36(4): 423-433. [BenDovMaGa2000]
Notes: A new species, *Ceroplastes reunionensis*, is described from Réunion, where it was found heavily infesting *Mangifera indica*, *Persea americana* and several ornamental plants. The closely related species, *C. rubens* Maskell, is redescribed from topotypic material collected in Queensland, Australia. These two species differ from each other in the wax test color, body color, morphological, biological and molecular characters (RAPD). Inter- and intraspecific variation of several morphological characters of both species is discussed. *Ceroplastes vinsonii* Signoret, 1872, is regarded as a *nomen oblitum*, and, therefore, becomes a new synonym of *Ceroplastes floridensis* Comstock, 1881.

Ben-Yehuda, S., Hadar, D., Wysoky, M., Izhar, Y. & Swirski, E. 2001 (1999). The importance of oils in the integrated management of the pyriform scale in avocado orchards in Israel. Entomophaga 33 (1999): 273. [BenYehHaWy2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. The pyriform scale, *Protopulvinaria pyriformis* (Cockerell) (Hemiptera: Coccoidea: Coccidae) was discovered in Israel in 1980 and within a few years had spread to most of the avocado growing regions of the country. Several major avocado varieties (mainly Nabal) are highly susceptible to the pyriform scale. Other less susceptible avocado varieties, in the vicinity of the infected sites, can become damaged as well. The damage is caused by the secretion of large amounts of honeydew, resulting in a thick cover of sooty-mould on the leaves and on the fruit. Despite the large numbers of local natural enemies which accumulate in infested areas, as well as the establishment of the introduced encyrtid *Metaphycus stanleyi* Compere, which between them often cause high mortality of the scale, injury to susceptible avocado varieties has not been prevented. As a routine, application of synthetic insecticides in avocado orchards in Israel is avoided. Hence, to lower the pyriform scale populations with minimum negative consequences to the natural enemies, we studied the effect of several oils and a soap application on the pyriform scale and the activity of the natural enemies. Several mineral oils ("mayonnaise-type" 1.75% (80% A.I.) and "stylet-oil" 1% (80% A.I.)) effectively controlled the scale nymphal stages. Therefore, oil application is conducted in the spring (February-April) and in the second half of the summer (July-October), when the population consists of mainly immature stages. Cotton oil and soap (potassium salt of fatty acids) were less effective. Application of the above mentioned compounds did not interfere with the activity of the natural enemies of the scale.

Bene, G. del, Gargani, E. & Landi, S. 2000. Evaluation of plant extracts for insect control. Journal of Agriculture and Environment for International Development 94(1): 43-61. [BeneGaLa2000]

Notes: This paper reports the results of trials on the insecticidal effect of the vegetal extracts Quassia, Rymania, Derris, Urtica, Artemisia and neem (*Azadirachta indica*). The insects targeted included *Ceroplastes rusci* and *Aonidia lauri*. Also studied were the side effects of the various products on the common parasitoid *Encarsia formosa*.

Bentley, W., Rice, R.E., Brazelle, J. & Day, K. 2000. Pests of nectarine. UC Pest Management Guidelines [BentleRiBr2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.nectarine.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of nectarine in the U.S., including *Quadrapsidiotus perniciosus*.

Bentley, W.J., Coates, W.W., Hasey, J., Hendricks, C.L., Olson, W.H., Pickel, C., Sibbett, G.S. & Van Steenwyk, R.A. 2000. Pests of walnut. UC Pest Management Guidelines [BentleCoHa2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.walnuts.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of walnut in the U.S., including *Parthenolecanium corni*, *P. pruinatum*, *Quadrapsidiotus perniciosus* and *Q. juglansregiae*.

Bentley, W.J., Hendricks, L., Duncan, R., Silvers, C., Martin, L., Gibbs, M. & Stevenson, M. 2001. BIOS and conventional almond orchard management compared. California Agriculture 55(5): 12-19. [BentleHeDu2001]

Notes: One of the objectives of this study was to evaluate the abundance of San José scale and its associated parasitoids in Biologically Integrated Orchard Systems (BIOS) and conventional almond orchards.

Bentley, W.J., Rice, R.E. & Day, K.R. 2000 (1998). Pests of plum. UC Pest Management Guidelines [BentleRiDa2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.plum.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of plum in the U.S., including *Parthenolecanium corni*, *Epidiaspis leperi* and *Quadraspidiotus perniciosus*.

Bentley, W.J., Rice, R.E., Beede, R.H. & Daane, K. 2000. Pests of pistachio. UC Pest Management Guidelines. [BentleRiBe2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.pistachios.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of pistachio in the U.S., including *Coccus hesperidum*, *Saissetia oleae*, *Parthenolecanium corni* and *P. pruinosa*.

Bentley, W.J., Zalom, F., Granett, J., Smith, R.J., Varela, L. & Purcell, A. 2000. Pest of grape. UC Pest Management Guidelines [BentleZaGr2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.grapes.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of grape in the U.S., including *Pseudococcus maritimus*, *P. viburni* and *P. longispinus*.

Bergelson, J., Dwyer, G. & Emerson, J.J. 2001. Models and data on plant-enemy coevolution. Annual Review of Genetics 35: 469-499. [BergelDwEm2001]

Notes: Although coevolution is complicated, in that the interacting species evolve in response to each other, such evolutionary dynamics are amenable to mathematical modeling. In this article, we briefly review models and data on coevolution between plants and the pathogens and herbivores that attack them. We focus on "arms races," in which trait values in the plant and its enemies escalate to more and more extreme values. Untested key assumptions in many of the models are the relationships between costs and benefits of resistance in the plant and the level of resistance, as well as how costs of virulence or detoxification ability in the enemy change with levels of these traits. A preliminary assessment of these assumptions finds only mixed support for the models. What is needed are models that are more closely tailored to particular plant-enemy interactions, as well as experiments that are expressly designed to test existing models. Black pineleaf scale, beech scale, armored scale insect and pinyon needle scale are mentioned as examples of empirical studies of local adaptation.

Bernal, J.S., Luck, R.F., Morse, J.G. & Drury, M.S. 2001. Seasonal and scale size relationships between citricola scale (Homoptera: Coccoidea) and its parasitoid complex (Hymenoptera: Chalcidoidea) on San Joaquin Valley citrus. Biological Control 20(3): 210-221. [BernalLuMo2001]

Notes: The phenology of citricola scale, *Coccus pseudomagnolarium* (Kuwana), and its associated parasitoid complex were studied on citrus in the San Joaquin Valley of central California over the period April 1995-March 1997. A total of 10,237 parasitoid specimens of 10 species were collected. Two of these species, *Marietta mexicana* (Howard) and *Encyrtus lecaniorum* (Mayr), each recovered from individually isolated scales, represent new parasitoid records for citricola scale. A third species, *Encarsia citrinus citrinus* (Craw), may represent a new parasitoid record, but this requires further confirmation because a single (male) specimen was recovered from individually isolated scales. The three most dominant parasitoid species, *Coccophagus lycimnia* (Walker), *Metaphycus helvolus* (Compere), and *Metaphycus luteolus* (Timberlake), accounted for the majority (>97%) of the specimens recovered. In contrast to the situation on citrus in southern California, where citricola scale is under effective biological control and is very rarely seen, citricola scale on citrus in the San Joaquin Valley is reemerging as a major pest, especially in groves employing integrated pest management with minimal use of broad-spectrum insecticides. Possible reasons uncovered in this study for the lack of effective biological control of citricola scale in the San Joaquin Valley include: (i) reduced presence of *Metaphycus* spp. because of hyperparasitism by the heteronymous hyperparasitoid *C. lycimnia*; (ii) absence of alternate

hosts for those species of *Metaphycus* present; and (iii) absence of hosts of suitable size for *Metaphycus* at critical times of the year. Recommendations for improving the level of biological control in the San Joaquin Valley are discussed.

Bertschy, C., Turlings, T.C.J., Bellotti, A.C. & Dorn, S. 2001. The role of mealybug-induced cassava plant volatiles in the attraction of the encyrtid parasitoids *Aenasius vexans* and *Apoanagyrus diversicornis*. Journal of Insect Behavior 14(3): 363-371. [BertscTuBe2001]

Notes: *Phenacoccus herreni*.

Bilog Obra, G.P. & Morallo Rejesus, B. 2000. Biological studies of *Aphytis* sp. nr. *chrysomphali* (Hymenoptera: Aphelinidae). Philippine Entomologist 14(2): 137-147. [BilogOMo2000]

Notes: The parasitoid *Aphytis* sp. nr. *chrysomphali* was collected from coconut scale, California red scale (*Aonidiella aurantii*) and Florida red scale (*Chrysomphalus ficus*) attacking citrus in August 1989 from Villaverde, Nueva Vizcaya, Philippines. The biology of the parasitoid on coconut scale, *Aspidiotus destructor* Signoret, reared on squash was studied. The total developmental period of the uniparental (thelytokous) parasitoid from egg deposition to adult emergence ranges from 13-15 days with a mean of 14.18±0.90.

Biswas, J. & Ghosh, A.B. 2000. Biology of the mealybug, *Planococcus minor* (Maskell) on various host plants. Environment & Ecology 18(4): 929-932. [BiswasGh2000]

Notes: The biology of the mealybug, *Planococcus minor* (Maskell) was studied in the laboratory on different host plants. The average duration of male and female nymphs respectively were 21.42 and 16.17 days on *Ixora signaporenensis*, 16.73 and 17.49 days on *Glycine max* and 21.30 and 21.80 days on *Acalypha wilkesiana*. The preoviposition and oviposition periods and fecundity were 8.25 and 9.25 days and 65.75 eggs on *I. signaporenensis*, 6.25 and 8.25 days and 132.50 eggs on *G. max* and 7.25 and 9.25 days and 138.75 eggs on *A. wilkesiana*.

Blachinski, D. & Dreeshpon, Y. 2000. [Spring control of the citrus mealybug (*Planococcus citri*).] (In Hebrew). Alon Hanotea 54(8): 316-318. [BlachiDr2000]

Notes: N/A

Blumberg, D. & Van Driesche, R.G. 2001. Encapsulation rates of three encyrtid parasitoids by three mealybug species (Homoptera: Pseudococcidae) found commonly as pests in commercial greenhouses. Biological Control 22: 191-199. [BlumbeVa2001]

Notes: Encapsulation rates of the parasitoids *Leptomastix dactylopii* Howard, *Leptomastix epona* (Walker), and *Anagyrus fusciventris* (Girault) (Homoptera: Encyrtidae) by the mealybugs *Planococcus citri* Risso, *Pseudococcus viburni* (Signoret), and *Pseudococcus longispinus* (Targioni-Tozzetti) (Homoptera: Pseudococcidae) were studied under controlled laboratory conditions.

Blumberg, D., Ben-Dov, Y. & Mendel, Z. 2001 (1999). The citriculus mealybug, *Pseudococcus cryptus* Hempel, and its natural enemies in Israel: History and present situation. Entomologica 33 (1999): 233-242. [BlumbeBeMe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The citriculus mealybug, *Pseudococcus cryptus* Hempel, was first discovered in Israel in 1937 and very rapidly became a key pest of citrus. However, since the early 1940s, the mealybug population has sharply decreased. This occurred in parallel with the establishment of the introduced parasitoid *Clausenia purpurea* Ishii, which was then believed to be the main cause of the biological control of the mealybug. Since the late 1980s, outbreaks of *P. cryptus* have been recorded mainly in new citrus varieties, such as red grapefruits, pomelo, "sweety" and several peeling varieties. The current outbreaks are probably related to the susceptibility of these mentioned varieties to *P. cryptus*, and to the adverse effects of Insect Growth Regulators to coccinellid predators, especially *Scymnus* spp. The introduced *C. purpurea* and two other local encyrtid parasitoids, *Leptomastix* near *algirica* and *Anagyrus diversicornis* Mercet, rarely emerged from samples of *P. cryptus* collected during 1996-1998. Four further parasitoid species were introduced into Israel during 1996-1997 against *P. cryptus*: from central Asia, the platygasterids *Allotropa burrelli* Muesebeck and *A. convexifrons* Muesebeck and the encyrtid, *Pseudaphycus malinus* Gahan; and from Japan, *Anagyrus sawadai* Ishii. *A. convexifrons* and *A. sawadai* successfully parasitized *P. cryptus*.

and, therefore, were released in the field but only *A. sawadai* has so far been recovered. A considerable reduction in population densities of the pest has been recorded since May, 1998, in the major release site of the latter species.

Bogo, A. & Mantle, P. 2000. Oligosaccharides in the honeydew of Coccoidea scale Insects: *Coccus hesperidum* L. and a new *Stigmacoccus* sp. in Brazil. Anais da Sociedade Entomologica do Brasil 29(3): 589-595. [BogoMa2000]

Notes: Analysis of the honeydew from an as yet undescribed, though distinctive, Brazilian *Stigmacoccus* sp. (near *S. asper* Hempel) by paper chromatography, Fast atom bombardment (FAB-MS) and Gas chromatography-mass spectrometry (GC-MS) identified fructose and glucose as monosaccharides and sucrose, maltose, trehalulose, trehalose and a hexose-hexitol as disaccharides. Erlose and glucosyl erlose have been identified as the tri- and tetra-saccharides in *Stigmacoccus* sp. and characterised for the first time in scale insects by modern techniques of linkage analysis. The same erlose oligosaccharides were recognised in honeydew of the common scale insect *Coccus hesperidum* L., together with the pentamer of this series, maltosyl erlose, therefore recognising that specific metabolic transformations of sugars into this oligomeric series occur rather widely in scale insects.

Bogo, A., Watson, G.W., Mantle, P.G. & Mottana G.M. 2001 (1999). Honeydew sugars eliminated by *Stigmacoccus* sp. nr. *asper* Hempel (Hemiptera: Margarodidae) feeding on leguminous trees in Brazil. Entomologica 33(1999): 275-278. [BogoWaMa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The sooty mould coating the trunks of mature trees of *Schizolobium excelsum* in Brazil was found to be associated with honeydew being eliminated by an undescribed species of margarodid near *Stigmacoccus asper* Hempel. Analysis of the honeydew sugars by paper chromatography revealed a complex composition. The principal sugar was sucrose, but there were significant amounts of fructose, glucose and three components identified as di-, tri- and tetrasaccharides. The disaccharides were maltose, trehalose, trehalulose and a hexose-hexitol. The other, apparently novel, pair of oligosaccharides were composed of glucose(s) 1,4 linked to the glucose of sucrose. The sugar composition of the tree sap was also determined and found to be glucose and sucrose only. The findings, therefore, imply significant and novel metabolic transformations of sugars by the scale insect and/or its microbial symbionts.

Bogran, C.E., Heinz, K.M. & Ciomperlik, M.A. 2002. Interspecific competition among insect parasitoids: Field experiments with whiteflies as hosts in cotton. Ecology 83(3): 653-668. [BogranHeCi2002]

Notes: *Aonidiella aurantii* and *Phenacoccus manihoti* are mentioned.

Bohidar, K. 2001 (1999). The taxonomic relationship of some Coccoidea (Hemiptera) based on male characteristics. Entomologica 33(1999): 165. [Bohida2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Male characters of species from five different families were studied and the taxonomic status of the families is described. A key of characters was presented for adult males. The quantitative evaluation method was applied to assess the relationship between the families. All the characters included were regarded as being of equal importance and those shared by any one family exhibited some differences, justifying the recognition of the taxon as a distinct family. It was found that the Margarodidae were the most primitive group followed by Pseudococcidae. The Diaspididae showed the maximum number of specialised characters, with the Coccidae and Dactylopiidae falling between the Diaspididae and the Pseudococcidae. The Coccidae and Dactylopiidae shared an equal number of characters with the Pseudococcidae and are considered to be close to each other.

Bongiorni, S., Mazzuoli, M., Masci, S. & Prantera, G. 2001. Facultative heterochromatization in parahaploid male mealybugs: involvement of a heterochromatin-associated protein. Development 128(19): 3809-3817. [BongioMaMa2001]

Notes: The behavior of chromosomes during development of the mealybug *Planococcus citri* provides one of the most dramatic examples of facultative heterochromatization. In male embryos, the entire haploid paternal chromosome set becomes heterochromatic at mid-cleavage. Male mealybugs are thus functionally haploid, owing to heterochromatization (parahaploidy). To understand the mechanisms underlying facultative heterochromatization in male mealybugs, we have

investigated the possible involvement of an HP-1-like protein in this process. HP-1 is a conserved, nonhistone chromosomal protein with a proposed role in heterochromatinization in other species. It was first identified in *Drosophila melanogaster* as a protein enriched in the constitutive heterochromatin of polytene chromosome. Using a monoclonal antibody raised against the *Drosophila* HP-1 in immunoblot and immunocytological experiments, we provide evidence for the presence of an HP-1-like in *Planococcus citri* males and females. The results indicate a role for an HP-1-like protein in the facultative heterochromatization process.

Botton, M., Hickel, E.R., Soria, S.J. & Teixeira, I. 2000. [Bioecology and control of ground pearl *Eurhizococcus brasiliensis* (Hempel, 1922) (Hemiptera: Margarodidae) in vine culture.] Bioecologia e controle da Pérola-da-terra *Eurhizococcus brasiliensis* (Hemiptera: Margarodidae) na cultura da videi (In Portuguese). Circular Técnica (EMBRAPA: Empresa Brasileira de Pesquisa Agropecuária) 27: 23 pp. [BottonHiSo2000]

Notes: *E. brasiliensis* is briefly described and photos are provided. A list of about 70 of its host plants, a description of the damage it inflicts on its hosts, its geographical distribution, and biological, cultural and chemical control are discussed.

Bribosia, E., Champagne, R. & Bylemans, D. 2000. [Useful organisms in orchards: the lady birds.] Nuttige organismen in boomgaarden: de lieveheersbeestjes. (In Dutch). Fruitteelt Nieuws 13(22) 26-28. [BribosChBy2000]
Notes: The most important Coccinellidae occurring in orchards are described, including *Adalia bipunctata*, *Synharmonia conglobata* [*Oenoplia conglobata*], and *A. decempunctata* (predators of aphids), *Chilocorus bipustulatus* and *Exochomus quadripustulatus* (predators of scales), and *Stethorus punctillum* (predator of mites). The effects of ecological factors (feed preference, habitat - especially vegetation layer, and natural enemies) on behaviour are also described.

Broschat, T.K. & Weissling, T.J. 2001. Susceptibility of lantana cultivars to *Orthezia insignis*. HortTechnology 11(3): 460-462. [BroschWe2001]

Notes: The greenhouse orthezia (*Orthezia insignis*) is a serious and widespread pest of cultivated lantanas (*Lantana* sp.) in warmer regions of the world. Forty species and cultivars of lantanas were screened for their relative susceptibility to this insect pest. Results showed that two Florida native lantanas, pineland lantana (*L. depressa*) and buttonsage (*L. involucrata*), were highly susceptible to infestation, with trailing lantana (*L. montevidensis*) and its cultivars and hybrids being somewhat less susceptible. Shrub lantana (*L. camara*) and its cultivars and hybrids were the least susceptible to greenhouse orthezia infestation, but some of these varieties are rather unattractive as landscape ornamentals and can become serious weeds.

Böhmer, H. 2000. Insect dyes. HALI: Carpet, Textile and Islamic Art 113: 57-60. [Bohmer2000]

Notes: Scale species mentioned include *Dactylopius coccus*, *Kerria lacca*, *Porphyrophora hameli*, *P. polonica* and *P. tritici*.

CAB International. 2000. *Phenacoccus madeirensis* Green. Distribution Maps of Pests Map no. 607: 4 pp. [CABI2000]

Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; map showing distribution of this sp. worldwide; countries listed with references to records; attacks cassava (*Manihot esculenta*) and many other crops including aubergine (*Solanum melongena*), oat (*Avena sativa*), cotton (*Gossypium* spp.), Coleus, Hibiscus, potato (*Solanum tuberosum*), *Capsicum annuum* and *Citrus* spp.

CAB International. 2000a. *Sphaeraspis vitis* (Philippi). Distribution Maps of Pests Map no. 608: 2 pp. [CABI2000a]

Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; map showing distribution of this sp. worldwide; countries listed with references to records; feeds on roots of many plants; seriously damages grapevine (*Vitis vinifera*).

Calatayud, P.A., Auger, J., Thibout, E., Rousset, S., Caicedo, A.M., Calatayud, S., Buschmann, H., Guillaud, J., Mandon, N. & Bellotti, A.C. 2001. Identification and synthesis of a kairomone mediating host location by two

parasitoid species of the cassava mealybug *Phenacoccus herreni*. Journal of Chemical Ecology 27(11): 2203-2217. [CalataAuTh2001]

Notes: Two encyrtid species, *Acerophagus coccois* and *Aenasius vexans*, parasitoids of the cassava mealybug *Phenacoccus herreni* use a contact kairomone from the body surface of their host as a host-location stimulant. The kairomone was synthesized and identified as O-caffeoyleserine based on a combination of chromatographic methods. The synthetic compound was determined to be active.

Calatayud, P.A., Seligmann, C.D., Polania, M.A. & Bellotti, A.C. 2001. Influence of parasitism by encyrtid parasitoids on the feeding behaviour of the cassava mealybug *Phenacoccus herreni*. Entomologia Experimentalis et Applicata 98(3): 271-278. [CalataSePo2001]

Notes: Three encyrtid parasitoids *Apoanagyrus (Epidinocarsis) diversicornis*, *Aenasius vexans*, and *Acerophagus coccois* (Hymenoptera: Encyrtidae) are used to control the cassava mealybug *Phenacoccus herreni* Cox & Williams (Sternorrhyncha: Pseudococcidae), an important pest of cassava in South America. The influence of parasitism on the feeding behaviour of mealybugs was studied by observing honeydew secretion and by the electrical penetration graph technique (EPG, DC-system). Honeydew secretions were observed after parasitism until mummy transformation. No strong EPG parameter differences were found between parasitised and control insects. All results indicated that parasitised mealybugs keep feeding on the phloem sap after parasitism until mummy transformation. The main influence of parasitism on EPG parameters is the appearance of a new pattern resembling the E2 pattern at the extracellular level and labelled H. This pattern was also produced with control insects located on an unfavourable feeding site and could be associated with a stress response. It might be related to the still unclear E(c) pattern of aphids. The relationship of H to stylet activities is discussed.

Cantini, R. & Battisti, A. 2001. Impact and control of the cone tortricid *Pseudococcux tessulatana* (Staudinger), damaging the cone crop of a selected clone of cypress (*Cupressus sempervirens* L.) in Italy. Anzeiger für Schädlingskunde 74(4): 107-110. [CantinBa2001]

Notes: The green cypress (*Cupressus sempervirens*) is of great interest for ornamental, reforestation and windbreak use in the whole Mediterranean basin. In Italy, seed material selected for resistance to the fungus *Seiridium cardinale* is produced in seed orchards by controlled crosses of parent trees. The insect pest showing the highest impact on seed cone production is *Pseudococcux tessulatana* (Lep.; Tortricidae), which attacks cones during the initial growth period as well as full-grown cones. The impact on the seed cone crop of the tortricid was estimated on a clone patented for its resistance to cypress canker (Agrimèd 1). The attack was inversely related to the cone crop, as it concerned 36.7% of cones in 1999 (high crop year) and the 66% in 2000 (low crop year). In both years, about 90% of the surveyed branches revealed cones attacked by *P. tessulatana* by the 1st life-cycle larvae, whereas only 40% of branches were also attacked by the larvae of the 2nd life cycle. The highest attack rate per branch was always observed on branches bearing a low number of cones. The potential of two control methods against *P. tessulatana* to protect cones which result from crossing a mother tree "Agrimèd 1" with selected father trees was also evaluated in 2000. The protection given by a sleeve surrounding the branch was almost complete (0.4% cone mortality), whereas a cone mortality of 24.3% was observed on branches treated by the insecticide diflubenzuron. Sleeves appear to be useful to protect branches on which special crosses were done, but are expensive and time-consuming and may favour the attack of the mealybug *Planococcus vovae* inside the sleeve.

Caprile, J., Varela, L., Pickel, C., Coates, W.W., Bentley, W.J. & Vossen, P.M. 2000. Pests of apple. UC Pest Management Guidelines [CaprilVaPi2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.apples.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of apple in the U.S., including *Epidiaspis leperii* and *Quadraspidiotus perniciosus*.

Chan, Y.K., Subhadrabandhu, S. (Ed.) & Chairidchai, P. 2000. Status of the pineapple industry and research and development in Malaysia. Acta Horticulturae No. 529: 77-83. [ChanSuCh2000]

Notes: [Proceedings of the Third International Pineapple Symposium, Pattaya, Thailand, 17-20 November 1998.] Malaysia, once ranked as one of the top three pineapple producers in the world in the 1960s and early 1970s, has only

a relatively modest industry today. However, the fresh pineapple export had picked up recently to 40000 tonnes worth RM 10 million in 1997. With the introduction of the new hybrid Josapine in 1996, the market for fresh pineapple is expected to increase further. Current research includes a focus on the management of mealybug closterovirus red wilt.

Charles, J.G., Froud, K.J. & Henderson, R.C. 2001 (1999). Morphological variation in the mealybugs *Pseudococcus calceolariae* and *P. similans* (Hemiptera: Coccoidea: Pseudococcidae). *Entomologica* 33(1999): 165. [CharleFrHe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Examination of slide-mounted laboratory-reared daughters from isolines of *Pseudococcus calceolariae* (Maskell) and *P. similans* (Lidgett) mothers collected from two widely separated locations in the North Island of New Zealand has thrown doubt on the validity of the defining characters of the species. For *P. similans*, the number and position of oral rim tubular ducts varied widely and sometimes fell outside the defined species limits. In addition, the characteristic 'stout abdominal setae' were lost in the F1 generation. The combinations of leg-length and number of oral rim tubular ducts which separate *P. calceolariae* (Maskell) from *P. similans* co-existed in cohorts of F1 sisters and both character-sets could be manipulated by changing the temperature at which the mealybugs developed. Mating studies are proposed to investigate whether the two species are valid, or whether they merely represent the phenotypic extremes of one widely polymorphic species.

Chatterjee, H., Ghosh, J. & Senapati, S.K. 2000. Influence of important weather parameters on population fluctuation on major insect pest of mandarin orange (*Citrus reticulata* Blanco) at Darjeeling district of West Bengal (India). *Journal of Entomological Research*. New Delhi 24(3): 229-233. [ChatteGhSe2000]

Notes: *Saissetia coffeae* shows a positive association with maximum temperature, R.H. and rainfall, but an inverse relation with minimum temperature. An identical relationship was observed with *Coccus hesperidum* for maximum and minimum temperatures.

Chen, Y.P. & Li, W.L. 2001. [Study on the major host plant species of lac insect, wax scale and gall aphids.] (In Chinese). *Forest Research* 14(1): 100-105. [ChenLi2001]

Notes: Lac insect, wax scale and gall aphids are the important resource insects in China. The host plant is not only the habitant and reproductive sites for resource insects but also their food resource. The species of host plant are various, and some of them are excellent hosts. The host plant species were extensively collected from the major production regions of lac, wax and Chinese gallnut, and then reproduced in Jingdong of Yunnan which is located in the southern subtropical region. More than 200 species, which belong to 98 genera and 36 families of host plants of lac insect, wax scale and gall aphids have been collected over many years. These species are valuable for studying these resource insects and their host plants.

Chirinos-Torres, L., Geraud-Pouey, F., Chirinos, D.T., Fernandez, C., Guerrero, N., Polanco, M.J., Fernandez, G. & Fuenmayor, R. 2000. [Effect of insecticides on *Capulinia* sp. near *jaboticabae* von Ihering (Hemiptera: Eriococcidae) and its natural enemies in Mara county, Zulia State, Venezuela.] (In Spanish; Summary In English). *Boletín de entomología venezolano* 15(1): 1-16. [ChirinGeCh2000]

Notes: [Original title: Efecto de insecticidas sobre *Capulinia* sp. cercana a *jaboticabae* von Ihering (Hemiptera: Eriococcidae) y sus enemigos naturales en el municipio Mara, estado Zulia, Venezuela.] The effect of several insecticide treatments on the guava cottony scale, *Capulinia* sp., and its natural enemies, was assessed under field conditions in Mara county, Zulia state, during April-September 1995.

Claps, L.E. 2000. [Redescription of five species of Diaspididae (Hemiptera, Coccoidea) of the Neotropical region.] Redescripción de cinco especies de Diaspididae (Hemiptera, Coccoidea) de la región neotropical. (In Spanish; Summary In English). *Revista Brasileira de Entomologia* 44(3/4): 91-95. [Claps2000]

Notes: *Acutaspis paulista*, *Dinaspis ichesii*, *D. lahillei*, *Protargonia larreae* and *Targionia fabianae* are described and illustrated. Synonymy, plants hosts and biology (when known) are given.

Claps, L.E. & Terán, A.L. 2001. [Diaspididae (Hemiptera: Coccoidea) associated with citrus in the province of Tucumán (Argentina). (In Spanish; Summary In English). Neotropical Entomology 30(3): 391-402. [ClapsTe2001] Notes: [Original title: Diaspididae (Hemiptera: Coccoidea) asociadas a cítricos en la provincia de Tucumán (República Argentina).] *Aonidiella aurantii*, *Aspidiotus nerii*, *Borchseniaspis palmae*, *Cornuaspis beckii*, *Chrysomphalus aonidum*, *C. dictyospermi*, *Insulaspis gloverii*, *Mycetaspis personata*, *Parlatoria cinerea*, *Parlatoria pergandii*, *Pinnaspis aspidistrae* and *Unaspis citri* are discussed on citrus plants in Tucumán, Argentina. A key for the recognition of the species, as well as the synonymy, characterization and illustration are also included. Data on economic importance and host plants are provided.

Claps, L.E., Wolff, V.R.S. & González, R.H. 2001 (1999). Catálogo de las especies de Diaspididae (Hemiptera: Coccoidea) nativas de Argentina, Brasil y Chile. (In Spanish; Summary In English). Insecta Mundi 13(3/4): 239-256. [ClapsWoGo2001]

Notes: [Publication distributed and postmarked 2001; date printed on issue is 1999.] 96 species of armoured scale insects (Diaspididae) described from Brazil, Argentina and Chile are reviewed in terms of synonymy, location of plant material, host plants, distribution within these southern hemisphere countries and bibliographical references.

Claps, L.E., Wolff, V.R.S. & González, R.H. 2001a. [Catalog of the exotic species of Diaspididae (Hemiptera: Coccoidea) from Argentina, Brazil and Chile.] (In Spanish; Summary In English). Revista de la Sociedad Entomológica Argentina 60(1/4): 9-34. [ClapsWoGo2001a]

Notes: [Original title: Catálogo de las Diaspididae (Hemiptera: Coccoidea) exóticas de la Argentina, Brasil y Chile.] 87 exotic species of armored scale insects from Brazil (69), Argentina (62) and Chile (29) are listed. Each species is reviewed in terms of host plants, geographical distribution, bibliographical references and economic importance. *Aonidiella*, *Quadraspisidiotus* and *Parlatoria* are mentioned as important for quarantine.

Colen, K.G.F., Santa Cecilia, L.C.V., Moraes, J.C. & Reis, P.R. 2000. [Effects of different temperatures upon the biology of the mealybug *Dysmicoccus brevipes* (Cockerell, 1893) (Hemiptera: Pseudococcidae).] (In Portuguese; Summary In English). Revista Brasileira de Fruticultura 22(2): 248-252. [ColenSaMo2000]

Notes: [Original title: Efeitos de diferentes temperaturas sobre a biologia da cochonilha pulverulenta *Dysmicoccus brevipes* (Cockerell, 1893) (Hemiptera: Pseudococcidae).] The biology of the mealybug *Dysmicoccus brevipes* (Cockerell, 1893) was studied at four temperatures: 20, 25, 30 and 35°C, aiming at the determination of its thermal requirements as basic information for pineapple pest management programs. The experiment was carried out at the Entomology Laboratory of the Centro Tecnológico do Sul de Minas (Technological centre of the south of Minas) -- CTSM/EPAMIG in Lavras-MG, during the period of June, 1996 to July, 1998, in a climate chamber. The insects were maintained on leaf fragments of pineapple cv. Smooth Cayenne. The length of the nymphal stages was inversely proportional to the temperature. Nymphal development was not completed at 35°C. The highest longevities were found at the temperature of 20°C for females and at 20 and 25°C for males. The inferior thermal threshold for development (base temperature) was 12.1; 13.5; 12.8 and 12.8°C for the 1st and 2nd instar nymphs, cocoon and nymphal periods, respectively. The thermal constants (K) for the nymphal phase of males was 393.4 degree-days and for females 605.6 degree-days. With the exception of the first instar, all the thermal constants obtained for females were superior to those determined for males.

Cook, L. 2001a (1999). *Apiomorpha*: an extraordinary scale insect genus. Entomologica 33: 166. [Cook2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. *Apiomorpha* is a gall-inducing eriococcid genus which is endemic to Australia, where it is restricted to *Eucalyptus*. Females of most species induce large and spectacular galls which generally have species-specific morphologies. *Apiomorpha* is one of the most chromosomally diverse of all animal genera. Closely related species usually have very different karyotypes and there is extensive chromosomal variation between populations within most morphologically defined species. Some, but not all, of the karyotypic variation within morphospecies probably represents species-level differences. A phylogeny of *Apiomorpha* based on DNA sequence data has been proposed, onto which chromosomal and morphological traits have been mapped. Both fusion and fragmentation appear to be playing a role in chromosomal evolution in this genus.

Cook, L. & Gullan, P.G. 2001 (1999). Are the enlarged ducts of *Eriococcus* (Hemiptera: Coccoidea: Eriococcidae) plesiomorphic? *Entomologica* 33(1999): 59-66. [CookGu2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Borchsenius (1948) separated the genus *Eriococcus* Targioni-Tozzetti (Eriococcidae) from *Acanthococcus* Signoret and *Gossyparia* Signoret on the basis of the occurrence of enlarged ducts in the adult female of the type-species, *E. buxi* (Fonscolombe). Enlarged ducts are found also in another Palaearctic species, a Chilean eriococcid and several Australian species of *Eriococcus*. The enlarged ducts of *Eriococcus* are similar in appearance and distribution to the large oral rim ducts of *Ferrisia* Fullaway (Pseudococcidae) and the dorsal tubercle ducts of *Ceronema* Maskell and some species of *Pulvinaria* Targioni-Tozzetti (Coccidae). It is argued that the enlarged ducts in taxa from each of these three families are homologous and therefore may be plesiomorphic for the Eriococcidae. If so, the possession of enlarged ducts is not of itself sufficient to justify the separation of *Eriococcus* as defined by Borchsenius.

Cook, L., Gullan, P. & Trueman, H. 2001 (1999). A putative molecular phylogeny of nine scale insect "families" and its implications. *Entomologica* 33(1999): 166. [CookGuTr2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. An incomplete and only partially tested molecular phylogeny of the scale insects based on 18S rDNA using sample taxa from the Margarodidae, Ortheziidae, Pseudococcidae, Coccidae, Kerriidae, Eriococcidae, Diaspididae, Dactylopiidae and Asterolecaniidae is presented. Aphids and psyllids have been included as outgroup taxa. The general topology is discussed in relation to the evolution of the scale insects. Several well-supported clades have major implications for the classification and taxonomy of the Eriococcidae. A phylogeny of the eriococcids based on sequence data from the mitochondrial gene cytochrome oxidase subunit II is in general agreement with the nuclear gene-based tree.

Cook, L.G. 2000. Extraordinary and extensive karyotypic variation: A 48-fold range in chromosome number in the gall-inducing scale insect *Apiomorpha* (Hemiptera: Coccoidea : Eriococcidae). *Genome* 43(2): 255-263. [Cook2000]

Notes: Chromosome number reflects strong constraints on karyotype evolution, unescaped by the majority of animal taxa. Although there is commonly chromosomal polymorphism among closely related taxa, very large differences in chromosome number are rare. This study reports one of the most extensive chromosomal ranges yet reported for an animal genus. *Apiomorpha* Rubsaamen (Hemiptera: Coccoidea: Eriococcidae), an endemic Australian gall-inducing scale insect genus, exhibits an extraordinary 48-fold variation in chromosome number with diploid numbers ranging from 4 to about 192. Diploid complements of all other eriococcids examined to date range only from 6 to 28. Closely related species of *Apiomorpha* usually have very different karyotypes, to the extent that the variation within some species-groups is as great as that across the entire genus. There is extensive chromosomal variation among populations within 17 of the morphologically defined species of *Apiomorpha* indicating the existence of cryptic species-complexes. The extent and pattern of karyotypic variation suggests rapid chromosomal evolution via fissions and (or) fusions. It is hypothesized that chromosomal rearrangements in *Apiomorpha* species may be associated with these insects' tracking the radiation of their species host genus, *Eucalyptus*.

Cook, L.G. 2001. Extensive chromosomal variation associated with taxon divergence and host specificity in the gall-inducing scale insect *Apiomorpha munita* (Schrader) (Hemiptera: Sternorrhyncha: Coccoidea: Eriococcidae) *Biological Journal of the Linnean Society* 72(2): 265-278. [Cook2001]

Notes: *Apiomorpha* Rubsaamen (Hemiptera: Coccoidea: Eriococcidae) is one of the most chromosomally diverse of all animal genera. There is extensive karyotypic variation within many of the morphologically defined species, including *A. munita* (Schrader) which is here reported to have diploid chromosome counts ranging from 6 to more than 100. Each of the three morphologically defined subspecies of *A. munita* also displays considerable chromosomal variation: *A. m. tereticornuta* Gullan ($2n = 6, 8, 20, 22$ or 24), *A. m. malleensis* Gullan ($2n = 6, 20, 22, 24$ or 26), and *A. m. munita* (Schrader) ($2n=54$ or >100). *Apiomorpha munita* appears to occur only on eucalypts of the informal subgenus *Sympyomyrtus*, with each of the subspecies of *A. munita* restricted to discrete symphyomyrt sections. Several different karyotypic forms within each subspecies of *A. munita* appear to be restricted to only one or a few eucalypt species or

series. The association between apparent host specificity and chromosomal rearrangements in *A. munita* suggests that both may be playing an active role in taxon divergence in *Apiomorpha*.

Cook, L.G., Gullan, P.J. & Stewart, A.C. 2000. First-instar morphology and sexual dimorphism in the gall-inducing scale insect *Apiomorpha* Rubsaamen (Hemiptera: Coccoidea: Eriococcidae). Journal of Natural History 34(6): 879-894. [CookGuSt2000]

Notes: Sexual dimorphism among crawlers of the scale insect family Eriococcidae is reported for the first time. The general morphology of crawlers of the gall-inducing genus *Apiomorpha* (Eriococcidae) is presented and sexual dimorphism described. Sexual dimorphism appears to be associated with differential dispersal and settling-site preference of the sexes during the crawler stage. First-instar males of the *A. pharetrata* and *A. munita* species-groups settle only on the galls induced by their mothers or, in the case of *A. munita*, also galls of nearby females, whereas female crawlers disperse. Female crawlers of all species of *Apiomorpha*, and male crawlers of most species, are well suited for air-borne dispersal. It is suggested that sexual dimorphism among crawlers of *Apiomorpha*, and some other scale insects, is the result of loss or reduction of those morphological features associated with dispersal. In addition, male crawlers of some species of *Apiomorpha* have sensory structures which may assist in the detection of sex-specific settling sites.

Costa, H., Cowles, R., Hartin, J., Kido, K. & Kaya, H. 2000. Pests of turfgrass. UC Pest Management Guidelines [CostaCoHa2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.turfgrass.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of turfgrass in the U.S., including *Odonaspis ruthae*.

Coviello, R. & Bentley, W.J. 2000. Pests of fig. UC Pest Management Guidelines [CovielBe2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.figs.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of fig in the U.S., including *Lepidosaphes conchiformis*.

Cravedi, P. 2000 (2001). Integrated peach production in Italy: objectives and criteria. (In German; Summary In French, Russian, Spanish). Pflanzenschutz Nachrichten Bayer 53(2-3): 177-197. [Craved2000]

Notes: Research has been conducted into integrated pest control for the peach tree in parts of Northern Italy since the early '70's. Research into integrated pest control of the peach tree has been conducted on the oriental fruitmoth, *Cydia /Grapholita molesta*, on the green peach aphid, *Myzus persicae*, on scales, *Pseudaulacaspis pentagona* and *Quadrapsidiotus /Diaspidiotus perniciosus*, on thrips, in particular *Frankliniella occidentalis*, and on the Mediterranean fruit fly, *Ceratitis capitata*. The effect of insecticides on the natural beneficials of key pests were taken into account in the choice of insecticides.

Cueva, B., Izquierdo, G., Crespo, J.F. & Rodriguez, J. 2001. Unexpected spice allergy in the meat industry. Journal of Allergy and Clinical Immunology 108(1): 144. [CuevaIzCr2001]

Notes: Cochineal is mentioned.

Daane, K.M., Barzman, M.S., Caltagirone, L.E. & Hagen, K.S. 2000. *Metaphycus annekei* and *Metaphycus hageni*: two discrete species parasitic on black scale, *Saissetia oleae*. BioControl 45(3):269-284. [DaaneBaCa2000]

Notes: Parasitized black scale, *Saissetia oleae*, were collected from olives (*Olea europaea* L.) in Spain and from this material an encyrtid parasitoid was reared that is taxonomically similar to *Metaphycus annekei* Guerrieri and Noyes. Differences were noted between the Spanish *Metaphycus* nr. sp. *annekei* and material described as *M. annekei* that is resident to California. Although dissimilar in few morphological characters, the ovipositor length and shape of the male genitalia and the antennal club of both sexes can be used to discriminate between *M. annekei* resident to California and the Spanish material, which was subsequently named *Metaphycus hageni* Daane and Caltagirone. To determine if morphological differences correspond to biological differences, reproductive and oviposition behaviours of Californian *M. annekei* and Spanish *M. hageni* were studied. Mating was not observed between individuals of the

two types and only male progeny were produced in interspecific pairings. *Metaphycus annekei* females deposit eggs through the scale's ventral side and were never observed to host feed, while *M. hageni* females oviposit through the scale's dorsum and frequently host fed. The collective biological evidence agrees with morphological evidence, indicating that *M. annekei* and *M. hageni* are discrete species. Specimens from recent collections in California and Spain were compared with specimens from earlier collections (1910s to 1980s) in Australia, California, Greece, Hawaii, Italy, Israel, Mexico, and South Africa. With the exception of Greek and Spanish material, all specimens examined were *M. annekei*. We discuss the significance of this new information with respect to biological control and provide a key to separate these and other closely related black scale parasitoids.

Danzig, E.M. 2001. Mealybugs of the genera *Peliococcus* and *Peliococcopsis* from Russia and neighbouring countries (Homoptera: Coccoidea: Pseudococcidae). *Zoosystematica Rossica* 9(1): 123-154. [Danzig2001]

Notes: The taxonomy of the genera *Peliococcus* Borchs. and *Peliococcopsis* Borchs. is discussed. Keys to species and descriptions and illustrations of most species are given. Three species are described as new: *Peliococcus rosae* sp. n. (Crimea and Hungary), *P. loculatus* sp. n. (W. Caucasus) and *P. latitubulatus* sp. n. (Armenia, Uzbekistan). Lectotypes are designated for 13 nominal species. The following new synonymies are established: *Peliococcus balteatus* (Green) = *venustus* (Green) = *saratogensis* (Rau); *P. kimmericus* (Kir.) = *mesasiaticus* (Borchs. & Kozarzh. = *pseudozillae* Borchs. = *bitubulatus* Borchs. = *xerophilus* Baz.; *P. tritubulatus* (Kir.) = *darvasicus* Num. & Baz.; *P. turanicus* (Kir.) = *perfidiosus* Borchs. = *terrestris* Borchs. = *unispinus* Borchs. & ter-Gr.; *P. daganae* (Bod.) = *armeniacus* Borchs.; *Peliococcopsis priesneri* (Laing) = *caucasicus* (Borchs.); *Phenacoccus hordei* (Lindeman) = *Ph. slavonicus* Laing = *Peliococcus unitubulatus* Borchs. & Ter-Gr.

Danzig, E.M. 2001a. A new mealybug of the genus *Phenacoccus* Signoret from Siberia (Hemiptera, Pseudococcidae). (In English; Summary In French). *Revue Française d'Entomologie* 23((1): 109-110. [Danzig2001a]

Notes: Description and illustration of adult female of *Phenacoccus loiki*, new sp. The host is *Dactylis glomerata* and it is compared to *Phenacoccus avenae*.

Danzig, E.M. 2001b (1999). Some aspects of the taxonomy of Palaearctic mealybugs (Hemiptera: Coccoidea: Pseudococcidae). *Entomologica* 33: 166-167. [Danzig2001b]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. In the group of mealybugs possessing oral rim ducts, the genera *Atrococcus* Goux, *Spilococcus* Ferris, *Chorizococcus* McKenzie and *Paracoccus* Ezzat & McConnell are discussed. The genus *Atrococcus* is a small natural group of species, sharing similar morphology, the presence of black pigment and a Palaearctic distribution. The borders between the other genera are not clear, as has been mentioned by other authors. The genera *Spilococcus* and *Chorizococcus* are separated from each other by the number of cerarii (6-17 or fewer), while the genus *Paracoccus* is characterized by the presence of an anal lobe bar. In the fauna of the former USSR, there are 6 species: *Spilococcus furcatispinus* (Borchsenius), *S. flavus* (Borchsenius), *S. expressus* (Borchsenius), *S. erianthi* (Kiritshenko), *S. herbaceus* Danzig and *S. halli* McKenzie & Williams. These are all very similar morphologically and are associated with grasses (the other 7 known species in the genus *Spilococcus* live on dicotyledons). The placement of these species in genera based on the number of cerarii (which varies from 1 to 17 pairs) or on the presence of an anal lobe bar (*S. expressus*) is here considered to be artificial. Therefore, it is here suggested that the genus *Spilococcus* should be accepted in the wide sense (at least for the fauna in the Palaearctic region).

Dorn, B., Mattiacci, L., Bellotti, A.C. & Dorn, S. 2001. Host specificity and comparative foraging behaviour of *Aenasius vexans* and *Acerophagus cocois*, two endo-parasitoids of the cassava mealybug. *Entomologia Experimentalis et Applicata* 99(3): 331-339. [DornMaBe2001]

Notes: Two encyrtid parasitoids, *Aenasius vexans* Kerrich (Hymenoptera: Encyrtidae) and *Acerophagus cocois* Smith (Hymenoptera: Encyrtidae), were compared for their degree of dietary specialisation and the impact this has on their foraging strategies. Both parasitoid species are significant for biological control of the cassava mealybug, *Phenacoccus herreni*, Cox & Williams (Homoptera: Sternorrhyncha) a major Latin American pest of cassava, *Manihot esculenta* Crantz, an important root crop. Host acceptance and parasitism were analysed in seven mealybug species (with different levels of polyphagy) occurring in and around cassava fields. Results demonstrate that, in this ecosystem, *An. vexans*

is a specialist for *P. herreni* while *Ac. cocois* is a generalist on the first and second trophic level. Of the seven mealybug species, *P. herreni* and *P. madeirensis* Green were the most acceptable hosts for *Ac. cocois*, followed by *Ferrisia virgata* Cockerell. *Ac. cocois* did not accept the other four mealybug species. The foraging and oviposition behaviour of individual parasitoids was observed in bioassays with cassava leaves infested by *P. herreni*. The two species used different strategies to locate their host. *Aenasius vexans* spent significantly more time walking and standing on an infested leaf and examined a host longer than did *Ac. cocois*. *Acerophagus cocois*, in contrast, spent more time for oviposition. As a consequence *An. vexans* parasitised more hosts in a given time than did *Ac. cocois*. Because the rate of offspring production of the two species did not differ, we conclude that the gregarious *Ac. cocois*'s strategy to deposit several eggs at once might compensate for its relatively low number of ovipositions, compared with the solitary *An. vexans*. These findings suggest that, given the advantages and limitations of each species, a multi-species approach to biological control of *P. herreni* may yield best results.

Dunkelblum, E., Mori, K. & Mendel, Z. 2001 (1999). Semiochemical activity of pheromones and analogues of three *Matsucoccus* species (Hemiptera: Coccoidea: Matsucoccidae). *Entomologica* 33(1999): 391-396. [DunkelMoMe2001]
Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The sex pheromone of the Israeli pine bast scale, *Matsucoccus josephi* Bodenheimer & Harpaz (Homoptera: Matsucoccidae), was identified as the ketone (2E,5R,6E,8E)-5,7-dimethyl-2,6,8-decatrien-4-one. The chiral diene chain is common also to the sex pheromones of *M. matsumurae* Bean & Godwin and *M. feytaudi* Ducasse. The species-specificity of the three pheromones is due to the differences in the second side chain of these ketones. Field and GC-EAD studies indicated that the sex pheromones of each of the three *Matsucoccus* spp. is a potent kairomone of both males and females of the predator *Elatophilus hebraicus* Pericart (Hemiptera: Anthocoridae). The response of *E. hebraicus* to the sex pheromones of *M. matsumurae* and *M. feytaudi* is particularly interesting since it does not occur in the distribution area of these two congeneric spp. These results prompted us to prepare a series of analogues with variations in the two side chains in order to probe the structure-activity relationship of the pheromonal/kairomonal attractancy of *M. josephi* and *E. hebraicus*. Field results indicate that alterations in the common diene moiety affected the kairomonal activity, while structural changes in the second side chain markedly reduced the pheromonal activity.

Eastwell, K.C. & Bernardy, M.G. 2001. Partial characterization of a closterovirus associated with apple mealybug-transmitted little cherry disease in North America. *Phytopathology* 91(3): 268-273. [EastweBe2001]

Notes: Little cherry disease (LChD) is a serious economic problem of sweet cherry production in western North America where apple mealybug is the principle vector. LChD is associated with a distinct species of double-stranded (ds) RNA. In this study, filamentous virus particles were purified from LChD-infected trees and shown to contain single-stranded RNA corresponding to the previously reported dsRNA isolated from infected trees. The virus particles were characterized and were similar to monopartite members of the genus Closterovirus. A portion of the genome was sequenced and found to be most closely related to the RNA-dependent RNA polymerase of Grapevine leafroll-associated virus-3, a mealybug-transmitted closterovirus. The characteristics of the mealybug-transmitted little cherry virus in North America are very different from those of a closterovirus associated with a similar disease in Europe.

Elkins, R.B., Van Steenwyk, R.A., Varela, L.G. & Pickel, C. 2000 (1999). Pests of pear. UC Pest Management Guidelines [ElkinsVaVa2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.pears.html>]. This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of pear in the U.S., including *Epidiaspis leperii*, *Pseudococcus maritimus*, *P. obscurus* and *Quadrapsidiotus perniciosus*.

Elwan, A.A. 2000. Survey of the insect and mite pests associated with date palm trees in Al-Dakhliya region, Sultanate of Oman. *Egyptian Journal of Agricultural Research* 78(2): 653-664. [Elwan2000]

Notes: The insect pests and mites associated with infested roots, stems, leaves, inflorescence and dates [*Phoenix dactylifera*] of date palm trees in the Al-Dakhliya region in Oman were surveyed. The insect pests and mites associated with infested roots, stems, leaves, inflorescence and dates [*Phoenix dactylifera*] of date palm trees in the Al-Dakhliya

region in Oman were surveyed from January 1994 to December 1996. Insect pests recorded included *Aonidiella orientalis*, *Fiorinia linderae*, *Maconellicoccus hirsutus*, *Parlatoria blanchardii* and *Phoenicococcus marlatii*.

Erkiliç, L.B. & Uygun, N. 2001 (1999). Observations on the population development of *Pseudaulacaspis pentagona* (Hemiptera: Coccoidea: Diaspididae) under semi-field conditions in the east Mediterranean region of Turkey. *Entomologica* 33(1999): 389. [ErkiliUy2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Populations of *Pseudaulacaspis pentagona* (Targioni Tozzetti) were observed on naturally infested young peach trees (cv. 'June Gold'), kept in 2x2x2m cages covered in cheese cloth under semi-field conditions. Overwintering adult females were marked (1x2.5cm) on the plants with special glue (Tangle Trap). Both the number of crawlers produced by each female and the duration of each development stage were recorded. In each generation, 35 females were observed. *P. pentagona* had four generations a year and the first crawlers appeared from overwintered females at the beginning of April. The first generation was completed in May, the second in July, the third in August and the fourth in September. The duration of each generation was found to vary significantly in relation to temperature, with the first generation taking the longest (71.6 days) and the second generation the shortest (61.2 days). The number of crawlers produced by each generation was also found to vary significantly. The greatest number of crawlers (99.4 crawlers per female) was produced by the overwintering females and the lowest number of crawlers (17.9 crawlers per female) by the fourth generation.

Erler, F. & Tunç, I. 2001. A survey (1992-1996) of natural enemies of Diaspididae species in Antalya, Turkey. *Phytoparasitica* 29(4): 299-305. [ErlerTu2001]

Notes: 26 species of predators and 11 species of parasitoids associated with 11 species of scale insects. Hosts include *Aonidiella aurantii*, *Lepidosaphes ulmi*, *Parlatoria oleae* and *Pseudaulacaspis pentagona*.

Fang, Z.G., Wu, S.A. & Xu, H.C. 2001. A list of bamboo scale insects in China. (Homoptera: Coccoidea). (In Chinese; Summary In English). *Journal of Zhejiang Forestry College* 18(1): 102-110. [FangWuXu2001]

Notes: A total of 127 species of scale insects (Homoptera: Coccoidea) attacking bamboos in China are listed, including Pseudococcidae (17 genera), Coccidae (3), Aclerdidae (2), Eriococcidae (1), Asterolecaniidae (5) and Diaspididae (12 genera). Data on their distribution, hosts and the part of the bamboo that they attack are given. Two new combinations and two new synonyms are established: *Planococcus bambusicola*, comb. nov., was transferred from *Planococcoides*; *Saccharicoccus bambusus*, comb. nov., transferred from *Palmicultor*; *Nipponaclerda triumpha* and *Bambusaspis nematosphaerica* are considered to be synonyms of *N. leptodemis* and *B. qingyuanensis*, respectively.

Ferraro, M., Buglia, G.L. & Romano, F. 2001. Involvement of histone H4 acetylation in the epigenetic inheritance of different activity states of maternally and paternally derived genomes in the mealybug *Planococcus citri*. *Chromosoma*. Berlin 110(2): 93-101. [FerrarBuRo2001]

Notes: Modification of histones by acetylation is a well-known mechanism for the establishment and maintenance of specific chromatin structures with different activity states. In *Planococcus citri* males the paternal genome, early in development, becomes mostly inactive and heterochromatic. As we had not found methylation in the genome of *P. citri*, we analyzed the acetylation state of histone H4. We report here that, in males, differences in the level of histone H4 acetylation are indeed present in the two genomes of different parental origin; these differences were confirmed by treatment with the histone deacetylase inhibitor Trichostatin A. There is also evidence of acetylation of histone H4 on metaphase chromosomes. Our data therefore suggest a role of histone H4 acetylation in the imprinting of the paternal genome in *P. citri* males, thus supporting a role of modification of chromatin-related structural proteins in the epigenetic transmission of imprinting.

Ferrer, F. 2001. Biological control of agricultural insect pests in Venezuela; advances, achievements, and future perspectives. *Biocontrol News and Information* 22(3): 67N-74N. [Ferrer2001]

Notes: Biological control has been practised in Venezuela from the beginning of the 20th century, beginning with the classical introductions of *Rodolia cardinalis* for controlling *Icerya purchasi*, *Aphelinus mali* for the woolly apple aphid (*Eriosoma lanigerum*), and *Apanteles thurberiae* for the cotton pest *Sacades pyralis*.

Foldi, I. 2001. [List of scale insects of France (Hemiptera, Coccoidea).] Liste des cochenilles de France (Hemiptera, Coccoidea). (In French; Summary In English). Bulletin de la Société Entomologique de France 106(3): 303-308. [Foldi2001]

Notes: 381 species listed belong to 143 genera and 13 families (including Pseudococcidae, Diaspididae, Coccidae, Eriococcidae, Margarodidae, Kermesidae, Ortheziidae, Asterolecaniidae, Cerococcidae, Aclerdidae, Dactylopiidae, Lecanodiaspidae and Phoenicococcidae). A separate list of scale insects that damage cultivated and ornamental plants is also provided.

Foldi, I. & Ben-Dov, Y. 2001. A nomenclatural note on *Steatococcus anonae* Newstead" (Hem., Coccoidea, Margarodidae). Bulletin de la Société Entomologique de France 106(5): 449-461. [FoldiBe2001]

Notes: This note mentions the absence of the publication of the name *Steatococcus anonae* by Newstead. The authors assume that Newstead provided the binomen *S. anonae* to Varyssiere, who used it.

Foldi, I. & Watson, G.W. 2001. A new pest scale insect on avocado trees in Colombia, *Laurencella colombiana*, sp. n. (Hemiptera: Coccoidea: Margarodidae). Annales de la Société Entomologique de France 37(3): 367-374. [FoldiWa2001]

Notes: A new scale insect pest of avocado trees (*Persea americana*, Lauraceae) in Colombia is becoming increasingly important at altitudes over 2000 meters above sea level, killing branches by excessive extraction of plant sap and reducing productivity by causing development of sooty mould on leaves and fruit. The adult male and female of *Laurencella colombiana*, sp. n. are described and illustrated. The female is recognizable by the presence of numerous distinctive cribiform cicatrices on the venter of the abdomen only. The genus *Laurencella* is redefined and placed in tribe Llaveiini (Monophlebinae). An identification key to the genera of Llaveiini and species of the genus *Laurencella* is provided. Other species of scale insect (Coccoidea) recorded on avocado worldwide are listed.

Foldi, I., Kozár, F. & Hodgson, C. 2001. *Rhodococcus luberonensis*, a new species of soft scale from France (Hemiptera, Coccidae). (In English; Summary In French). Bulletin de la Société Entomologique de France 106(6): 449-461. [FoldiKoHo2001]

Notes: The adults male and female, 2nd-instars male and female and pupa of a new species of *Rhodococcus*, *R. luberonensis* n. sp. (Coccidae; Coccoidea) off *Rhamnus saxatilis* from the south of France (Petit Luberon mountain, Vaucluse) are described and illustrated. This new species of *Rhodococcus* brings the number of species in this genus to 7. The similarity of *R. luberonensis* to species of *Eulecanium* is discussed.

Follett, P.A. 2000. Arthropod pests of papaya in Hawaii. Chronica Horticulturae 40(3): 7-10. [Follet2000]

Notes: Notes are provided on the biology, harmfulness and control of the main pests of pawpaw in Hawaii. These are Tephritidae, *Pseudaulacaspis pentagona*, *Empoasca* spp. and Aphididae. Some minor pests are also listed.

Fontana, P. & Pellizzari, G. 2001 (1999). On the identity of the genus *Lecanopsis* Targioni Tozzetti. Entomologica 33(1999): 67-72. [FontanPe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The genus *Lecanopsis* Targioni Tozzetti was generally accepted by coccidologists until 1994. In that year, on the basis that the exact facies of the genus was not known and that there was no type material, it was proposed that all the species previously included in *Lecanopsis* be transferred to the genus *Paralecanopsis* (synonymised with *Lecanopsis* in 1980) and that only the type species, *L. rhyzophila* Targioni Tozzetti, be retained in *Lecanopsis*, thus allowing a proper diagnosis of this group. In order to clarify the identity of the genus *Lecanopsis*, we have carefully checked the original descriptions of the genus and of its type species by Targioni Tozzetti and by Signoret. This work has highlighted some small mistakes in the translation of the original description from Italian or Latin to French and also some omissions, and these could have led to the conclusion that the real facies of this genus was not known and that the type species, *L. rhyzophila*, could not be congeneric with the other species currently included in *Lecanopsis*. However, some original drawings of *Lecanopsis* by Targioni Tozzetti, which he sent to Signoret in 1872, have been discovered in the Muséum Nationale d'Histoire Naturelle, Paris. On the basis of this new information,

and with the support of the authoritative opinion of two members of the International Commission of Zoological Nomenclature, we consider that (i) the genus *Lecanopsis* is a valid genus and propose (ii) that the species of *Lecanopsis* recently transferred to the genus *Paralecanopsis* Bodenheimer be re-assigned to the genus *Lecanopsis* Targioni Tozzetti.

Food and Agriculture Organization/World Health Organization Expert Committee on Food Additives 2001.
Evaluation of certain food additives and contaminants. World Health Organization Technical Report Series 901: i-viii, x, 1-107. [FAO2001]

Notes: This report represents the conclusions of a Joint FAO/WHO Expert Committee convened to evaluate the safety of various food additives and contaminants, with a view to recommending Acceptable Daily Intakes (ADIs) and tolerable intakes, respectively, and to prepare specifications for the identity and purity of food additives. The first part of the report contains a general discussion of the principles governing the toxicological evaluation of food additives and contaminants (including flavouring agents), and the establishment and revision of specifications. A summary follows of the Committee's evaluations of toxicological data on various specific food additives (including cochineal extract), flavouring agents and contaminants (cadmium and tin), and of intake data on calcium from calcium salts of food additives.

Foxcroft, L.C. & Hoffmann, J.H. 2000. Dispersal of *Dactylopius opuntiae* Cockerell (Homoptera: Dactylopiidae), a biological control agent of *Opuntia stricta* (Haworth.) Haworth. (Cactaceae) in the Kruger National Park. Koedoe 43(2): 1-5. [FoxcroHo2000]

Notes: Chemical control efforts, the introduction of *Cactoblastis cactorum* and attempted releases of *Dactylopius opuntiae* Cockerell into the expanding infestation of *Opuntia stricta* in the Skukuza region of the Kruger National Park (KNP) have had limited success in preventing the spread and densification of *O. stricta*. To boost the biological control component, a new strain of *D. opuntiae* was introduced into KNP during 1997. The new strain established readily and has destroyed large clumps of plants in the vicinity of the release site. A large-scale redistribution programme with *D. opuntiae* is now needed to exploit this biological control agent to the full. In order to match the frequency of manual releases with the natural rates of spread of the insects, surveys were conducted under field conditions to determine the dispersal abilities of *D. opuntiae*, with regard to rate and direction of movement. Dispersal of *D. opuntiae* was found to be slow and restricted and that the insects need to be redistributed by placing them onto plants at approximately 10 m intervals to ensure that they become quickly and evenly distributed on the weed. This information will be crucial in the revision of the integrated management plan for *O. stricta* in the KNP, in integrating the cochineal and other control mechanisms.

Fraguas, J.C., Soria, S.J. & Hochmüller, D.P. 2000. [Field observations on the inter-relationships between population levels of the Brazilian ground pearl *Eurhizococcus brasiliensis* (Homoptera, Margarodidae) and some soil fertility factors.] (In Portuguese; Summary In English). Entomología y Vectores 7(4): 339-354. [FraguaSoHo2000]

Notes: [Original title: Observações de campo sobre as interrelações entre níveis populacionais da pérola-da-terra, *Eurhizococcus brasiliensis* (Homoptera, Margarodidae) e alguns fatores de fertilidade do solo.] This species is a very aggressive scale insect pest parasitizing the root system of vineyards and inducing premature dieback of fruit plants in the south of Brazil. This paper reports on information regarding the degree of influence of some soil fertility factors in the face of the magnitude of the population levels of this species in naturally infested vineyards.

Franco, J.C. & Marotta, S. 2001 (1999). A survey of mealybugs (Hemiptera: Coccoidea: Pseudococcidae) in citrus groves in continental Portugal. Entomologica 33(1999): 191-196. [FrancoMa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] A survey of mealybugs living in citrus groves was carried out in order to elucidate the identity and relative importance of the species associated with this crop in Continental Portugal. Samples were collected in 76 citrus groves from the districts of Beja, Coimbra, Évora, Faro, Lisboa, Porto, Santarém, Setúbal and Viseu. The presence of mealybugs was detected in 93% of the citrus groves studied. Four species were identified, i.e. *Planococcus citri* (Risso), *Pseudococcus calceolariae* (Maskell), *P. viburni* (Signoret) and *P. longispinus* (Targioni Tozzetti). *P. citri* and *P. calceolariae* were the most frequent species, present in 66% and 63% of the citrus groves,

respectively. *P. viburni* and *P. longispinus* were identified in 29% and 14% of the sites, respectively. Apparently, *P. calceolariae* has the widest geographical distribution on citrus in Portugal. The co-existence of at least two species in the same citrus grove was found in 59% of the cases. *P. citri* and *P. calceolariae* were found associated in 37% of the citrus groves; *P. viburni* was always found associated with at least one of the three other species.

Franco, J.C., Silva, B.E. & Carvalho, J.P. 2000. (In Portuguese). In: [Mealybugs associated with citrus in Portugal.] Cochonilhas-algodão (Hemiptera, Pseudococcidae) associadas aos citrinos em Portugal. ISA Press, Lisbon. 142 pp. [FrancoSiCa2000]

Notes: Synonymy, common names, morphology, geographic distribution, hosts, life cycles and biology are topics covered.

Franke, I.H., Fegan, M., Hayward, C., Leonard, G. & Sly, L.I. 2000. Molecular detection of *Gluconacetobacter sacchari* associated with the pink sugarcane mealybug *Saccharicoccus sacchari* (Cockerell) and the sugarcane leaf sheath microenvironment by FISH and PCR. FEMS Microbiology Ecology 31(1): 61-71. [FrankeFeHa2000]

Notes: Molecular tools for the detection of the newly described acetic acid bacterium *Gluconacetobacter sacchari* from the pink sugarcane mealybug, *Saccharicoccus sacchari* Cockerell (Homoptera: Pseudococcidae), and in the sugarcane leaf sheath microenvironment were developed. *G. sacchari* specific 16S rRNA-targeted oligonucleotide primers were designed and used in PCR amplification of *G. sacchari* DNA directly from mealybugs, and in a nested PCR to detect low numbers of the bacteria from sugarcane leaf sheath fluid and cane internode scrapings. A sensitivity level of detection of 40-400 cells/reaction was obtained using PCR from exponentially grown bacterial cultures and of 1-10 cells in cane internode scrapings and leaf sheath fluid samples using nested PCR. The specificity of the primer set was demonstrated by the lack of amplification product formation in PCR by closely related acetic acid bacteria, including *Gluconacetobacter liquefaciens*, and *Gluconacetobacter diazotrophicus*. A Cy3 labeled probe for *G. sacchari* was designed and shown to be specific for the species. Investigation of the mealybug microenvironment by whole cell fluorescent in situ hybridization revealed that *G. sacchari* appears to represent only a minor proportion of the population of the microbiota in the mealybugs tested. This study has shown the usefulness of 16S rRNA-based molecular tools in the identification and detection of *G. sacchari* from environmental samples and will allow these tools to be used in further ecological research.

Fukatsu, T. & Nikoh, N. 2000. Endosymbiotic microbiota of the bamboo pseudococcid *Antonina crawii* (Insecta, Homoptera). Applied and Environmental Microbiology 66(2): 643-650. [FukatsNi2000]

Notes: The intracellular symbiotic microbiota of the bamboo pseudococcid *Antonina crawii* was characterized by performing a molecular phylogenetic analysis in combination with in situ hybridization. Almost the entire length of the bacterial 16S rRNA gene was amplified and cloned from *A. crawii* whole DNA. Restriction fragment length polymorphism analysis revealed that the clones obtained included three distinct types of sequences. Nucleotide sequences of the three types were determined and subjected to a molecular phylogenetic analysis. The first sequence was a member of the gamma subdivision of the division Proteobacteria (gamma-Proteobacteria) to which no sequences in the database were closely related, although the sequences of endosymbionts of other homopterans, such as psyllids and aphids, were distantly related. The second sequence was a beta-Proteobacteria sequence and formed a monophyletic group with the sequences of endosymbionts from other pseudococcids. The third sequence exhibited a high level of similarity to sequences of *Spiroplasma* spp. from ladybird beetles and a tick. Localization of the endosymbionts was determined by using tissue sections of *A. crawii* and in situ hybridization with specific oligonucleotide probes. The gamma- and beta-Proteobacteria symbionts were packed in the cytoplasm of the same mycetocytes (or bacteriocytes) and formed a large myctome (or bacteriome) in the abdomen. The spiroplasma symbionts were also present intracellularly in various tissues at a low density. We observed that the anterior poles of developing eggs in the ovaries were infected by the gamma- and beta-Proteobacteria symbionts in a systematic way which ensured vertical transmission. Five representative pseudococcids were examined by performing diagnostic PCR experiments with specific primers; the beta-Proteobacteria symbiont was detected in all five pseudococcids, the gamma-Proteobacteria symbiont was found in three, and the spiroplasma symbiont was detected only in *A. crawii*.

Gaimari, S.D. & Tanasijtshuk, V.N. 2001. A new leucopine genus (Diptera: Chamaemyiidae) with species attacking *Ceroplastes* wax scales (Hemiptera: Coccidae) in South America. *Systematic Entomology* 26(3): 311-328. [GaimarTa2001]

Notes: A new genus, *Echinoleucopis*, is proposed within Chamaemyiidae (Diptera). All known species of the genus are from South America and are predators on eggs within an ovisac of wax scales in genus *Ceroplastes* Gray (Hemiptera: Coccidae).

Ganeshan, S. 2000. Biological control of sugarcane pests in Mauritius: current status and future prospects. 3-9. In: Allsopp, P.G. (Ed.) & Suasa Ard, W., Sugarcane Pest Management in the New Millennium. 4th Sugarcane Entomology Workshop International Society of Sugar Cane. International Society of Sugar Cane Technologists, Indooroopilly, Australia. [Ganesh2000]

Notes: Manipulation of the environment through classical biological control and adoption of cultural measures, such as weed control and cane trashing, have been the main pest management strategies implemented for many years in Mauritius. Several species of parasitoids and predators have been introduced and released against major pests including *Aulacaspis tegalensis* (Zehntner). *A. tegalensis* remains a chronic pest causing severe but localised losses in some regions. Outbreaks of occasional pests such as the soft scale *Saccharipulvinaria iceryi* (Signoret) have been managed by implementation of measures favouring the multiplication of its natural enemies. However, studies on the economic importance of these pests and the presence of several species of parasitoids have revealed that their control by insecticides might not be cost effective and could be detrimental to the parasitoids.

Gang, F.Z. & Jun, L. 2000. [Biological observations and control of *Kuwanaaspis howardi*] (In Chinese; Summary In English). *Journal of Bamboo Research* 19(2): 78-80. [GangJu2000]

Notes: *Kuwanaaspis howardi* is mainly a sucking pest of bamboo shoots of *Phyllostachys praecox*, *P. dulcis*, and other [? *Phyllostachys*] species in China. The paper gives a brief account of its biology, life cycle and control. Observations in [Zhejiang Province] have shown that there are two generations per year, with overwintering by the fertilized adult female. Effective control of the pest is achieved either by injection of omethoate (40%) at the rate of 1:10 in the bamboos chamber [culm] or by smearing on the surface of the bamboo. Some control can be achieved using ordinary washing-powder (1:200) puffed onto the bamboo straw.

Gardosik, S.M. 2001. *Aspidiotus cryptomeriae* Kuwana, an armored scale pest of conifers (Homoptera: Diaspididae). *Regulatory Horticulture* (PA Dept. of Agric.) 27(200): 23-25. [Gardos2001]

Notes: Hosts and distribution, identification, life history, damage and control are discussed.

Geiger, C.A., Daane, K.M., Bentley, W.J., Yokota, G.Y. & Martin, L.A. 2001. Sampling program for grape mealybugs improves pest management. *California Agriculture* 55(3): 19-27. [GeigerDaBe2001]

Notes: The results of a mealybug study in Central Valley vineyards, designed to develop sampling guidelines, reveal that mealybug distribution on vines varies greatly through the season and that mealybugs usually prefer concealed locations, such as under bark. This combination makes sampling difficult. A number of sampling techniques were compared. Three- or 5-minute timed counts were most efficient because samplers could follow the mealybugs' movement over the season. Midseason counts were much better predictors of damage at harvest than early season counts. This research confirms past control guidelines and opens new control options. Grape bunches touching vine trunks or spurs will have higher damage. Removing these bunches or using barriers between bunches and mealybug oviposition sites can also reduce damage.

Geraud-Pouey, F., Chirinos, D.T. & Romay, G. 2001. [Physical effect of exfoliation of guava tree bark on *Capulinia* sp. near to *jaboticabae* von Ihering (Hem.: Eriococcidae)] Efecto fisico de las exfoliaciones de la corteza del guayabo (*Psidium guajava*) sobre *Capulinia* sp. cercana a *jaboticabae*. (In Spanish; Summary In English). *Entomotropica* 16(1): 21-27. [GeraudChRo2001]

Notes: Since it appeared in Venezuela in early 1993, the guava cottony scale, *Capulinia* sp. has become the greatest entomological problem on guava trees, *Psidium guajava*. However, in the field, trees with smooth bark (with little or without exfoliations) tend to be much less infested by this insect. During May-July 1999, the physical effects of bark

exfoliation on the establishment, survival and development of *Capulinia* sp. was assessed, in the laboratory. Three host plant conditions were included: with natural exfoliations; with bark mechanically smoothed (smooth bark); and exfoliations substituted by pieces of absorbent paper adhered to the smoothed bark (artificial exfoliations). Bark smoothness could constitute a source of resistance of guava plants to diminish the incidence and damages by *Capulinia* sp.

Gertsson, C.A. 2001. An annotated checklist of the scale insects (Homoptera: Coccoidea) of Sweden. [Förtehnung över Sveriges sköldlöss.] (In English; Summary In Swedish). Entomologisk Tidskrift. Stockholm 122(3): 123-130. [Gertss2001]

Notes: This checklist identifies 72 species records from the 30 Swedish provinces. 13 additional species are listed from Norway, Finland and/or Denmark. Remarks are given for 57 species, including notes on records and references to the literature. A bibliography is concluded.

Ghabbour, M.W. 2001 (1999). Descriptions of the first-instar nymphs of three species of *Lepidosaphes* Shimer and a species of *Insulaspis* Mamet (Hemiptera: Diaspididae). Entomologica 33(1999): 73-83. [Ghabbo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The first-instar nymphs of two species of the genus *Lepidosaphes* (namely *L. beckii* (Newman) and *L. ficus* (Signoret)) are described and illustrated and compared with the first-instar nymph of *L. ulmi*. The first-instar nymph of *Insulaspis tapleyi* (Williams) is also described and illustrated, and the differences between *I. tapleyi* and *I. pallidula* (Green) are discussed. Keys are provided for the separation of the first-instar nymphs of these five species.

Ghosh, A.B. & Ghose, S.K. 2000. Effect of Some Ecological Factors on the Nymphal Development of Mealybug, *Nipaecoccus viridis* (Newstead) Pseudococcidae : Hemiptera). Environment & Ecology 18(4): 922-925. [GhoshGh2000]

Notes: The developmental periods of all female nymphs and up to second male nymphs of the mealybug, *Nipaecoccus viridis* (Newstead), were prolonged when reared individually. The development of female and male nymphs were also delayed at constant relative humidity of 40, 60 and 80%. Third nymphal females at 80% and fourth nymphal males at 60 and 80% moulted 5 days later than at other humidity levels. The constant exposure to light had induced moulting earlier than darkness in second nymphal females only. The presence of attending ant, *Camponotus oblongus* Sm. accelerated the development and moulting in first instar nymph.

Giliomee, J.H. 2001 (1999). The Asterolecaniidae (Hemiptera: Coccoidea) of South Africa. Entomologica 33(1999): 85-89. [Giliom2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The 16 species of Asterolecaniidae known from South Africa can be tentatively placed in six genera based on the characters of the adult female (*Abditococcus*, *Asterodiaspis*, *Asterolecanium*, *Bambusaspis*, *Planchonia* and *Russellaspis*). Some species do not fit into these genera as presently defined, requiring a redefinition of some genera or the creation of new ones. However, it appears that the characters on which the genera of the Asterolecaniidae are presently based are too few in number and unreliable, making a detailed study of other characters of the female and eight other stages necessary for a better understanding of the relationships within this family.

Gillani, W.A. & Copland, M.J.W. 2001 (1999). Defensive behaviour of the longtailed mealybug *Pseudococcus longispinus* (Targioni Tozzetti) (Hemiptera: Pseudococcidae) against the brown lacewing *Symppherobius fallax* Navas (Neuroptera: Hemerobiidae). Entomologica 33(1999): 279-285. [GillanCo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The defensive tactics of 2nd- and 3rd-instar nymphal and adult *Pseudococcus longispinus* (Targioni Tozzetti) against larval *Symppherobius fallax* Navas were studied. When attacked by 1st- and 2nd-instar predators, these three mealybug stages were able to secrete ostiolar fluids which spread and hardened on the mouthparts of the predators; 1st-instar mealybugs appeared to be unable to secrete ostiolar fluids. Adult

mealybugs also successfully defended themselves against 1st-instar predators by simply pushing them away with their cerarial wax fringe. Of the lacewing stages, 3rd-instar *S. fallax* larvae were the most successful at overcoming the defense tactics of *P. longispinus*.

Gilrein, D. 2001. Tipping the scales. *Grounds Maintenance* 36(9): 10,14-16. [Gilrei2001]

Notes: Types of scales discussed in a general way include mealybugs (Pseudococcidae), soft scales, wax scales and tortoise scales (Coccidae), armored scales (Diaspididae), felt scales or eriococcids (Eriococcidae), margarodid scales (Margarodidae), bark crevice scales (Cryptococcidae), gall scales or kermesids (Kermesidae) and pit scales or asterolecaniids (Asterolecaniidae). Description of damage, hosts and control are discussed.

Gitirana Neto, J., Carvalho, C.F., Souza, B. & Santa Cecilia, L.V.C. 2000. [Population dynamics of the *Pinnaspis aspidistrae* (Signoret, 1869) (Hemiptera: Diaspididae) in citrus trees in Lavras - MG.] (In Portuguese; Summary In English). *Ciencia e Agrotecnologia* 24(3): 632-645. [GitiraCaSo2000]

Notes: [Original title: Flutuaçao populacional de *Pinnaspis aspidistrae* (Signoret, 1869) (Hemiptera: Diaspididae) em citros, na regiao de Lavras - MG.] The population dynamics of *Pinnaspis aspidistrae* was studied from May 1992 to April 1996 in a citrus orchard located in Lavras, Minas Gerais, Brazil. Leaves, twigs and fruits infested with male second instar nymphs were collected weekly from 5 trees of each citrus cultivar (Natal, Valencia, Baia and Ponkan). *P. aspidistrae* was found all over the orchard in all months sampled, with infestations varying in different hosts and seasons. Generally, the greatest infestations occurred in periods characterized by low temperature and rainfall. The highest populations were observed during September/October for Natal, during August for Valencia and during May/August for Baia, while Ponkan exhibited low population densities throughout the study.

Gomez, L.D. & Kisimova-Horovitz, L. 2001. A new species of *Septobasidium* from Costa Rica. *Mycotaxon* 80: 255-259. [GomezKi2001]

Notes: *Septobasidium wilsonianum* associated with scale insects (Diaspididae, Coccoidea, Homoptera) attached to *Topoea multiflora*, Melastomataceae, is described and illustrated as a new species. It is the first report of a species of *Septobasidium* occurring on a member of the Melastomataceae.

Goncalves-Gevasio, R.D.R. & Santa-Cecilia, L.V.C. 2001. Food consumption of *Chrysoperla externa* in different developmental phases of *Dysmicoccus brevipes*, under laboratory conditions. (In Portuguese). *Pesquisa Agropecuaria Brasileira* 36(2): 387-391. [GoncalSa2001]

Notes: The food consumption and preference of larvae of *Chrysoperla externa* Hagen, 1861 Neuroptera: Chrysopidae) larval were studied in laboratory under 25 +/- 2 degrees C, 70 +/- 10% RH and 12 hours photophase, utilizing the pineapple mealybug (*Dysmicoccus brevipes* Cockerell, 1893, Hemiptera: Pseudococcidae) as a prey. The results showed that the predator's larval phases consumed on average of 70, 50 and 15,8 mealybugs of the first, second and third instar, respectively, and 10 adult females amounting to 145,8 individuals. It was noticed that 5 1% of the total number of mealybugs were consumed during the predator third instar. The high number of mealybugs consumed shows that *C. externa* presents a potential to be utilized in biological control of the mealybug *D. brevipes*.

Gonsalves, D. 2000. Grapevine leafroll-associated closteroviruses: Characterization and transgenic resistance. *Phytopathology* 90(6)(Suppl.): S91. [Gonsal2000]

Notes: GLRaV 3 is transmitted by mealybugs, while GLRaV 1 may be transmitted by scale insects.

Gonzalez, P. 2000. First record of the genera *Chilecoccus* and *Icelococcus*, and two *Acanthococcus* species (Hemiptera: Eriococcidae) for Argentina. *Revista de la Sociedad Entomologica Argentina* 59(1-4): 51-52. [Gonzal2000]

Notes: Two genera: *Icelococcus* Miller & Gonzalez and *Chilecoccus* Miller & Gonzalez, and two *Acanthococcus* species are listed on *Nothofagus* (Fagaceae) for the first time in Argentina in this paper. They were also cited for Chile on the same hosts.

González, R.H., Poblete G., J. & Barria P., G. 2001. [Bionomics of the tree fruit mealybug in Chile, *Pseudococcus viburni* (Signoret).] El chanchito blanco de los frutales en Chile, *Pseudococcus viburni* (Signoret), (Homoptera: Pseudococcidae). (In Spanish; Summary In English). Revista Fruticola 22(1): 17-26. [GonzalPoBa2001]
Notes: Biology, hosts, chemical control and illustrations of *P. viburni*.

Gonçalves Gervasio, R, de C.R. & Santa Cecilia, L.V.C. 2001. [Food consumption of *Chrysoperla externa* in different developmental phases of *Dysmicoccus brevipes*, under laboratory conditions.] (In Portuguese; Summary In English). Pesquisa Agropecuaria Brasileira 3(2): 387-391. [GoncalDe2001]

Notes: The food consumption and preference of *Chrysoperla externa* larvae were studied in a laboratory under 25±°C, 70±10% RH and 12 h photophase, utilizing the pineapple mealybug (*Dysmicoccus brevipes*) as a prey. The high number of mealybugs consumed indicated that *C. externa* is a potential biological control agent of *D. brevipes*.

Grafton-Cardwell, E.E., Morse, J.G., O'Connell, N.V. & Phillips, P.A. 2000. Pests of citrus. UC Pest Management Guidelines [GraftoMoOC2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.citrus.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of citrus in the U.S., including *Aonidiella aurantii*, *A. citrina*, *Coccus hesperidum*, *C. pseudomagoliarum*, *Icerya purchasi*, *Lepidosaphes beckii* and *Saissetia oleae*.

Grafton-Cardwell, E.E., Ouyang, Y., Striggow, R. & Vehrs, S. 2001. Armored scale insecticide resistance challenge San Joaquin Valley citrus growers. California Agriculture 55(5): 20-25. [GraftoOuSt2001]

Notes: *Aonidiella aurantii* and *A. citrina* are among the insect pests discussed.

Gross, S., Biraty, Y. & Gal, S. 2001. [Using powdery and microcapsular preparations to decimate ant populations on citrus trees.] (In Hebrew; Summary In English). Alon Hanotea 55(5): 219-221. [GrossBiGa2001]

Notes: Citrus trees were treated with chlorpyrifos (5% powder formulation at 100 g/tree, or 1 and 2% microcapsule formulation sprayed on and around the trunk, at 1 litre/tree) or carbosulfan (2% powder formulation applied on the trunk, 100 g/tree) to study their effects against ant infestation. All treatments were effective in controlling the ant population. Also, low mealybug fruit infestation and higher exportable yield were recorded from the treated plants compared with the untreated controls.

Gross, S., Gefen, D., Rotman, N., Tadmor, U., Zemer, B., Gotlib, A. & Gefen, Y. 2000. Chemical control of the spherical mealybug (*Nipaecoccus viridis*) (Newstead) in citrus. (In Hebrew; Summary In English). Alon Hanotea 54(6): 234-240. [GrossGeRo2000]

Notes: The spherical mealybug infests all parts of the citrus tree. Its damage is expressed by excretion of large quantities of honeydew which encourages sooty mould to cover most parts of the tree, appearance of irregular green spots on the fruit and malformed fruit which are rendered inexportable. Herewith we report on field trials, which compared the efficacy of various chemical treatments to control the spherical mealybug. Identical dosages of Mospilan (acetamiprid 20 SP) were applied at two stages of development: before blossom and on small fruits (15-20 mm). Those treatments were compared to the standard chemical treatment of chlorpyrifos, and to non-treated control plots. The results indicate that there is no advantage in applying Mospilan prior to blossom. Effective control was achieved by Mospilan 0.05% and 0.075% sprayed on small fruits or by 0.3% chlorpyrifos at both stages of development.

Guerrieri, E. & Noyes, J.S. 2002. An unusual genus and species of Encyrtidae (Hymenoptera: Chalcidoidea) from Australia reared from soft scale insects (Hemiptera: Coccoidea). Journal of Natural History 36(4): 443-448. [GuerriNo2002]

Notes: *Arketypon vaderi* gen. et sp. nov. is described from Australia and its systematic position is discussed. It was reared as a gregarious endoparasitoid of *Myzolecanium* sp. (Hemiptera: Coccoidea) found in the nest of *Camponotus* sp. (Hymenoptera: Formicidae) nesting in a hollow stem of *Sonneratia alba* Smith (Sonneratiaceae).

Guerrieri, E., Pedata, P.A., Romani, R., Isidoro, N. & Bin, F. 2001. Functional anatomy of male antennal glands in three species of Encyrtidae (Hymenoptera : Chalcidoidea). Journal of Natural History 35(1): 41-54. [GuerriPeRo2001]
Notes: The occurrence of male antennal glands in three hymenopteran parasitoids belonging to the family *Encyrtidae* (*Leptomastix dactylopii*, *Rhopus meridionalis* and *Asitus phragmitis*) is reported for the first time. The ultrastructure and function of these glands are described in detail. The possible behavioural and taxonomical implications are discussed. Hosts include *Chaetococcus phragmitis* and *Planococcus citri*.

Gullan, P.J. 2001 (1999). Why the taxon Homoptera does not exist. Entomologica 33(1999): 101-104. [Gullan2001]
Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Many researchers still use the name Homoptera for the higher taxon of any member of the Sternorrhyncha (Aleyrodoidea, Aphidoidea, Coccoidea and Psylloidea) or Auchenorrhyncha (Cercopoidea, Cicadoidea, Cicadelloidea and Fulgoroidea), or to refer collectively to the Sternorrhyncha plus Auchenorrhyncha. Recent work based on morphological and molecular studies provides phylogenetic evidence that the Homoptera is paraphyletic and therefore its use should be abandoned.

Gullan, P.J. & Cook, L.G. 2001 (1999). Are cochineal insects Eriococcids? Entomologica 33(1999): 91-99. [GullanCo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Scale insects of the genus *Dactylopius* Costa, which all feed on cacti, are commonly called cochineal insects. Currently there are nine described species placed in their own family, the Dactylopiidae, based on a few unique morphological features. Here we review available biological, morphological and karyotype information on *Dactylopius* and report on cladistic analyses of morphological data (from first-instar nymphs plus adult females, and adult males separately) and molecular data (from the nuclear gene 18S rDNA and the mitochondrial gene cytochrome oxidase II) from *Dactylopius* and its potential relatives. We suggest that *Dactylopius* belongs with the eriococcids and we discuss the nomenclatural implications of this placement.

Gullan, P.J. & Sjaarda, A.W. 2001. Trans-Tasman *Platycoelostoma* Morrison (Hemiptera: Coccoidea: Margarodidae) on endemic Cupressaceae, and the phylogenetic history of margarodids. Systematic Entomology 26: 257-278. [GullanSj2001]

Notes: A new species of *Platycoelostoma* Morrison (Hemiptera: Coccoidea: Margarodidae) is described from the Tasmanian endemic conifer, *Diselma archeri* (Cupressaceae), growing in alpine heathland. Its sister species, *P. compressa* (Maskell), occurs in alpine and subalpine New Zealand on *Libocedrus bidwilli* (Cupressaceae). Vicariance dating provides a minimum age for *Platycoelostoma* of about 80 Ma. Cladistic analysis of morphological data from adult females and first-instar nymphs suggests that *Platycoelostoma* is the sister genus of *Callipappus* Guerin-Meneville and also is more closely related to members of subfamilies Margarodinae and Xylococcinae than to the New Zealand and South American genera of Coelostomidiinae, to which *Platycoelostoma* traditionally has been linked. The analysis also indicates that most traditional tribal groupings within Margarodidae are monophyletic, but that three (Coelostomidiinae, Margarodinae and Xylococcinae) of the five subfamilies in the widely used higher classification of Morrison may be either paraphyletic or polyphyletic as currently defined. Only Monophlebinae and Steingeliinae have adequate support from morphological characters. Relationships among subfamilies and many tribes are unresolved. These results lend some support to the classification previously proposed by Koteja, in which all margarodid subfamilies and a few tribes are elevated to the rank of family. Furthermore, the analysis suggests that Marchalini and Monophlebinae (in which all immature female instars have well developed appendages) are derived with respect to other margarodids and thus development via legless intermediate female instars ('cyst' form) may be plesiomorphic within margarodids. This hypothesis is weakly supported and requires corroboration from independent data. *Platycoelostoma* is transferred to tribe Callipappini, which is redefined, but the subfamily placement of this tribe must remain uncertain until the higher classification and rank of the various margarodid taxa can be re-evaluated. A revised generic description of *Platycoelostoma*, based on the adult and intermediate female instars and the first instar of both species, and a key to separate the female instars of both species are provided. The first-instar nymph, all female instars and the third-instar male (the prepupa) of *Platycoelostoma tasmanicum* sp.n. are described and illustrated. Scanning electron micrographs depict the unusual cuticular features of the third-instar female.

Handique, P.K. & Baruah, R. 2000. [Evaluation of Biomix-1 against mealy bug (*Maconellicoccus hirsutus* Green) of mulberry.] Indian Journal of Sericulture 39(1): 79-80. [HandiqBa2000]

Notes: Laboratory studies showed that Biomix-1 at a 1% concentration [based on plant extracts of unstated composition] was as effective against *Maconellicoccus hirsutus* as dimethoate at 0.1%.

Hansen, J.D. 2001. Ultrasound treatments to control surface pests of fruit. HortTechnology 11(2): 186-188. [Hansen2001]

Notes: Durations of ultrasound treatments were evaluated for efficacy in removing or destroying external pests of apples (*Malus sylvestris* var. *domestica*). Ultrasound did not remove San Jose scale (*Quadrapsidiotus perniciosus*, Homoptera: Diaspididae), from the fruit surface. Ultrasound, which can be incorporated in the packing line, shows promise as a postharvest phytosanitation treatment against external pests.

Hare, J.D. & Morgan, D.J.W. 2000. Chemical conspicuousness of an herbivore to its natural enemy: Effect of feeding site selection. Ecology 81(2): 509-519. [HareMo2000]

Notes: A physical refuge from the parasitoid *Aphytis melinus* is provided to the California red scale *Aonidiella aurantii* by the interior bark substrates of citrus trees, even though scales have lower fitness on bark in the absence of *A. melinus*. How bark-reared scales escape parasitism was unclear because *A. melinus* searches the interior of trees as effectively as the exterior. Host identification in *A. melinus* is mediated by a kairomone, O-caffeooyltyrosine, in scale covers. O-caffeooyltyrosine concentration varies with scale age and rearing conditions. We hypothesized that the reduced acceptance of bark-reared scale may be due, in part, to reduced quantities of O-caffeooyltyrosine in their covers. We reared scales on bark, leaves, and fruit of lemon and orange trees in the field at monthly intervals and then collected the scales and measured them. We bioassayed covers for their acceptability to *A. melinus* in the laboratory and then determined their O-caffeooyltyrosine content. Even after adjusting for the differences in scale body size, O-caffeooyltyrosine content in bark-reared scale covers was 45-85% less than that in covers of leaf- or fruit-reared scales, depending upon cultivar and rearing date. Covers of bark-reared scales were selected for probing only 40-45% of the time when compared to leaf-reared scales. Covers with the highest levels of O-caffeooyltyrosine were most likely to be selected for probing. We conclude that part of the mechanism by which California red scales avoid discovery on bark is through reduced O-caffeooyltyrosine content in their covers. This reduction is probably a consequence of the reduced nutritional quality of bark as a substrate for scale survival and growth.

Harris, P. 2001. The history of host range testing for classical weed biocontrol agents. Agriculture and Agri-Food Canada, Research Branch <http://res2.agr.ca/lethbridge/weedb> [Harris2001]

Notes: *Dactylopius coccus* is mentioned as a cactus-feeding mealybug and a commercial source of red dye.

Heckroth, H.-P., Fiala, B. & Maschwitz, U. 2001. Integration of scale insects (Hemiptera: Coccoidea) in the southeast Asian ant-plant (*Crematogaster* (Formicidae)-*Macaranga* (Euphorbiaceae)) system. Entomologica 33: 287-295. [HeckroFiMa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The coccid colonisers of myrmecophytic *Macaranga* were tested for their trophic integration into the mutualistic *Crematogaster-Macaranga* ant-plant system. Honeydew secretion by these mostly endophytic scale insects was observed in *Coccus caviramicolus* Morrison, *C. penangensis* Morrison, *P. secretus* Morrison, *C. tumuliferus* Morrison, *C. tumuliferus* var. C.84 and in two other *Macaranga* coccid species. However, the use of coccids as protein-rich food by ants under normal and starvation conditions was not observed.

Heidari, M. 2001 (1999). The intrinsic rate of increase and temperature co-efficients of the Comstock mealybug, *Pseudococcus comstocki* (Kuwana) (Hemiptera: Coccoidea: Pseudococcidae). Entomologica 33(1999): 297-303. [Heidar2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Life history studies on the development of *Pseudococcus comstocki* (Kuwana) were made under laboratory conditions at four constant temperatures, namely 18, 22, 26 and 30°C.

Temperature proved to have a significant effect on development, survival, reproduction and longevity, and on the sex ratio of *P. comstocki*. Reproduction, survival and longevity were greatest at 22-26°C and lowest at 30°C, which was detrimental to the nymphs. It was also found that the sex ratio became female biased at 30°C. On the basis of these data, the intrinsic rate of natural increase (r_m) was computed to be 0.05, 0.07, 0.10 and 0.08 at the above temperatures and the gross reproduction rate (GRR) was also temperature dependent and was calculated to be 153, 249, 210 and 57. The lower temperature threshold for development (TL) was estimated to be 11.0°C and the time from birth to adulthood (K) 523 degree days.

Heidari, M. 2001a (1999). Influence of host-plant physical defenses on the searching behaviour and efficacy of two coccinellid predators of the obscure mealybug, *Pseudococcus viburni* (Signoret). Entomologica 33: 397-402. [Heidar2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Laboratory and glasshouse trials were conducted to investigate the influence of host-plant physical structure on the predation of the obscure mealybug, *Pseudococcus viburni* (Signoret) (Coccoidea: Pseudococcidae) by two coccinellid predators: *Cryptolaemus montrouzieri* (Mulsant) and *Nephus reunioni* Fürsch. Glasshouse trials showed that good control was achieved by *C. montrouzieri* irrespective of the hairiness of the plant species, but that *N. reunioni* was more effective on smooth leaves, such as those of Citrus, coffee and *Passiflora*, than on hairy plants, such as *Streptocarpus* and tomato, on which the density of the trichomes and their sticky exudations significantly reduced the walking speed and other searching parameters. It is concluded that the size of the predator and the type of trichomes have a marked influence on the level of mealybug control and that this could influence the choice of predators.

Helal, E.M., Donia, A.R., El Hamid M.M.A. & Zakzouk, E.A. 2000. Abundance of insect and mite species in some citrus orchards. Proceedings of the International Conference on Integrated Fruit Production No. 525: 443-453. [HelalDoEl2000]

Notes: [Conference held in Leuven, Belgium, 27 July-1 August 1998.] A survey of pests and mites occurring on *Citrus sinensis* Qsheck var. Washington navel and *Citrus aurantium* L. at Alexandria and Damanhour, Egypt, was carried out for a whole year. Seven insect pests were found, of which the citrus white fly, *Aleurotrachelus citri* was the most common. The predator *Chrysopa vulgaris* [*Chrysoperla carnea*] also occurred, attacking the citrus mealy bug *Planococcus citri*. Eleven phytopagous, predaceous and saprophagous mite species prevailed on orange and sour orange in both experimental locations. In addition, four mite species were found associated with weeds growing in citrus orchards at Alexandria, including one phytopagous and three predaceous species. The results indicated that *Aleurotrachelus citri* is a major pest of citrus. Its pattern of distribution was followed at both locations. The correlations between temperature and relative humidity and the abundance of insects and mites on both citrus species were studied. The correlations between the predaceous mites and their prey were also investigated.

Hellemans, A. & Goossens, F. 2000. [Control of common scale (*Parthenolecanium pomeranicum*) on *Taxus*.] Bestrijding van gewone dopluis (*Parthenolecanium pomeranicum*) op *Taxus*. (In Dutch). Verbondsnieuws 44(19): 27-29. [HellemGo2000]

Notes: Studies were carried out in 1998 in Belgium to compare the efficacy of Mitac (200 g amitraz/litre), Deltanet 400 EC (400 g furathiocarb/litre), Confidor 200 SL (200 g imidacloprid/litre), Applaud (250 g buprofezin/litre), and Karate 25 WG (2.5% lambda-cyhalothrin) for the control of *P. pomeranicum* on 7- and 8-year-old *T. baccata*. Treatments were carried during the last larval stage (22 and 29 April 1998) and after ova budding (29 June and 8 July 1998). The most effective insecticides for the first period (last larval stage) were Mitac, Deltanet and Confidor, and Mitac, Deltanet and Karate for the 2nd period.

Henderson, R. 2001 (1999). The structure and function of the test of New Zealand male soft scale insects. Entomologica 33(1999): 167. [Hender2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Male scale insects (Hemiptera: Coccoidea) undergo a metamorphosis from scale-like nymph through prepupa and pupa to winged adult. The nymphal instar preceding the

prepupa secretes a protective cover or test under which these complex life changes take place. Each family of scale insects is characterised by a different type of male covering, whether cocoon, cap or test. Male mealybugs make rather fluffy cocoons from cottony wax strands, eriococcids produce woven wax covers, while armoured scales incorporate their moulted skins into waxy caps. The Coccidae or soft scales construct glassy wax tests. This test, being rigid, needs a mechanism to allow for the emergence of the adult male. A suture across the posterior third of the test enables the back plate to flex at a pair of hinges (so forming something akin to an "up-and-over garage door"). The hinges are secreted by groups of tubular ducts on the dorsum of the 2nd-instar males. The rows of hexagonal wax-plates found in the male tests of most New Zealand Coccidae are apparently unique in the way they are constructed. Scanning electron micrographs show the detail and diversity of the hinge types and how the hexagonal plate structure of the test is distinct from the back plate suture. Very little research has been published on male scale insects and even less on their coverings. In comparison with North American species, only two species of New Zealand native soft scales have male tests similar to those in other parts of the world.

Henderson, R.C. 2000. The status of *Parlatoria* species (Hemiptera: Coccoidea: Diaspididae) in New Zealand. New Zealand Entomologist 23: 51-53. [Hender2000]

Notes: Three species of *Parlatoria* are found in New Zealand: *Parlatoria desolator* McKenzie, *P. fulleri* Morrison and *P. pittospori* Maskell. Previous records of *P. pergandii* Comstock and *P. virescens* Maskell from New Zealand are based on misidentifications of *P. desolator*. The sole record of *P. zizophi* (Lucas) is based on a dubious quarantine record.

Henderson, R.C. 2001a. New synonymies for two armoured scale insects (Hemiptera: Coccoidea: Diaspididae) on *Dysoxylum spectabile*. New Zealand Entomologist 24: 89-90. [Hender2001a]

Notes: The taxonomy of *Aspidiotus nerii* and *Pinnaspis dysoxyli* are clarified in this report.

Henderson, R.C. & Rhode, B.E. 2001. The hinged back plate mechanism in glassy wax tests of New Zealand male soft scale insects (Hemiptera : Coccoidea : Coccidae). Arthropod Structure & Development 30(1): 1-14. [HenderRh2001]

Notes: Male scale insects (Hemiptera: Coccoidea) undergo a metamorphosis of the neometabola type, from scale-like nymph through prepupa and pupa to winged adult. The nymphal instar before prepupa secretes a waxy protective covering that remains in place throughout metamorphosis and these covers are characteristic of each family of scale insects. Most scale insect families (e.g. mealybugs, eriococcids, diaspidids) have rather loosely woven male covers, but male nymphs in the family Coccidae (soft scales) construct more rigid, glassy wax tests, which need a special mechanism for adult emergence. In the New Zealand male soft scales, a suture across the posterior quarter of the test enables the back plate to flex at a pair of hinges, to be raised up off the substrate, and so allow egress. The waxy back plate hinges are secreted by groups of tubular ducts on the abdominal dorsum of 2nd-instar males, during construction of the test, scanning electron micrographs (SEMs) show the detail and diversity of hinge types. The wax tests of most New Zealand Coccidae, both female and male, are apparently unique in that they are constructed in rows of hexagonal plates, separated by sutures, however in the male test, the sutures are all fused except for the back plate suture. The two species in the endemic New Zealand genus *Pounamococcus* have male tests more like those of species in the Australian genus *Austrolecanium*.

Hickel, E.R., Peruzzo, E.L. & Schuck, E. 2001. Control of the Ground-Pearl *Eurhizococcus brasiliensis* (Hempel) (Homoptera: Margarodidae) with chemigation. Neotropical Entomology 30(1): 125-132. [HickelPeSc2001]

Notes: The ground-pearl *Eurhizococcus brasiliensis* (Hempel) (Homoptera: Margarodidae) is the main pest of vineyards in Southern Brazil. The normal pest control strategies do not affect the pest population because the insects are in the underground and develop a resistant form like a cyst. With the aim to apply the chemigation for the control of ground-pearl, an assay was carried out in the laboratory. Tubes of 50 mm of PVC tubes (150 mm phi) were cut and received a screen cover in one circular side. The tubes were then filled with natural soil, collected at Videira Experimental Station. Five tubes were put on the top of each other to form a test tube with distinct soil depths. Cysts of ground-pearl were put in the depths of 100 mm and 200 mm. The treatments were aldicarb 0.525 g i.a./plant (as a standard), metidathion 80 ml a.i./100 l, diazinon 90 ml a.i./100 l, imidacloprid 21 g a.i./100 l and destiled water (as an untreated control). The liquid insecticides and the water were applied as a surface drench at a rate of 20 l/m super(2).

The best control was achieved with metidathion, resulting in 83.3% mortality after five months. Diazinon and imidacloprid resulted in 45.2% and 6.0% mortality respectively, while aldicarb resulted only in 1.2% mortality.

Hinkens, D.M., McElfresh, J.S. & Millar, J.G. 2001. Identification and synthesis of the sex pheromone of the vine mealybug, *Planococcus ficus*. *Tetrahedron Letters* 42 (2001): 1619-1621. [HinkenMcMi2001]

Notes: Sexually mature females of an important agricultural pest, the vine mealybug, *Planococcus ficus*, produces the monoterpene (*S*)-lavandulol and the corresponding ester, (*S*)-(+) -lavandulyl senecinate. The racemic ester was highly attractive to mature male mealybugs, whereas lavandulol was not. The naturally produced 2.5 blend of lavandulol and the ester also was no more attractive than the ester alone.

Hippe, C. & Frey, J.E. 2001 (1999). Biology of the horse chestnut scale, *Pulvinaria regalis* Canard (Hemiptera: Coccoidea: Coccidae), in Switzerland. *Entomologica* 33(1999): 305-309. [HippeFr2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] In 1997, many lime (*Tilia* spp.) and horse chestnut (*Aesculus hippocastanum*) trees in the centre of Zurich were found to be heavily infested by the horse chestnut scale, *Pulvinaria regalis* Canard. The biology of this introduced coccid was studied for one year. Crawlers hatched from the end of May and moved to the leaves of their host plants. There the nymphs settled and fed until Sept./Oct., when they migrated to adjacent twigs to overwinter as the 3rd-instar females. After the final nymphal moult in the spring, the adult female went through a period of rapid growth. Adult males appeared for a short period at the beginning of May but were rare. At this time, the females began to move to the main branches and the trunk of the tree, where they secreted a white ovisac consisting of wax filaments. Shortly after oviposition, the females died but remained attached to the ovisac. Two species of aphelinid (*Coccophagus lycimnia* (Walker) and, much less commonly, *C. semicircularis* (Förster)) emerged from parasitised scale nymphs in May (on twigs) and at the beginning of September (on leaves). The average rate of parasitisation of *P. regalis* was low (3-5%). No dipteran and only a few coccinellid predators were found during the sampling period.

Hodges, A.C. & Hodges, G. 2001. Notes on members of the Vespidae foraging on honeydew secretions from the European fruit lecanium, *Parthenolecanium corni* (Bouche). *Journal of Entomological Science* 36(3): 312-314. [HodgesHo2001]

Notes: Interactions among the insects found on *P. corni* honeydew are discussed. *Ultracoelostoma* spp. (Margarodidae) are also mentioned.

Hodgson, C. & Martin, J.H. 2001. Three noteworthy scale insects (Hemiptera : Coccoidea) from Hong Kong and Singapore, including *Cribropulvinaria tailungensis*, new genus and species (Coccidae), and the status of the cycad-feeding *Aulacaspis yasumatsui* (Diaspididae). *Raffles Bulletin of Zoology* 49(2): 227-250. [HodgsoMa2001]

Notes: Observations are presented on the current status of the cycad-feeding armoured scale, *Aulacaspis yasumatsui* Takagi (Diaspididae), in Singapore and Hong Kong. A new genus and species of soft scale, *Cribropulvinaria tailungensis* (Coccidae) from *Aporusa dioica* (Euphorbiaceae) is described from Hong Kong, with all stages except prepupa, and the possible relationships of this new genus discussed. The soft scale, *Maacoccus cinnamomicolus* (Takahashi), recently rediscovered in Singapore, has its adult female redescribed, 1st- and 3rd-instar nymphs described for the first time, and a lectotype designated.

Hosagoudar, V.B., Ganesan, R., Devi, D. & Ganesan, T. 2001. An observation on the sooty mould covered loquat tree. *Journal of Economic and Taxonomic Botany* 25(1): 13-14. [HosagoGaDe2001]

Notes: *Eryobotrya japonica* is a fruit plant, introduced in hill stations of India, and is associated with scale insects. These fungal colonies prevent the entry of sunlight to the photosynthetic cells of the plant and also obstruct an immediate evaporation of the transpired water.

Houston, D.B. & Houston, D.R. 2000. Allozyme genetic diversity among *Fagus grandifolia* trees resistant or susceptible to beech bark disease in natural populations. *Canadian Journal of Forest Research* 30(5): 778-789. [HoustoHo2000]

Notes: American beech (*Fagus grandifolia* Ehrh.) trees resistant (R = 760) and susceptible (S = 681) to beech bark disease were located and mapped in nine natural stands in West Virginia (WV), Massachusetts (MA), Maine (ME), Nova Scotia (NS), and Prince Edward Island (PEI). Dormant bud tissue collected from each tree was examined by isozyme analysis to characterize the population genetic structure of R and S subpopulations mapped in each of four intensively sampled (R/S) stands, and five additional populations in which only R trees were sampled. Seventeen enzymes (with 9 polymorphic and 14 monomorphic loci) were analyzed to estimate variation across the spatial range of disease occurrence. All populations possessed significant levels of inter- and intra-population diversity; several parameters appeared to increase in magnitude from southwest to northeast across the range. Beech bark disease occurs after infestations of *Cryptococcus fagisuga* populations.

Hsu, J.C., Horng, S.B. & Wu, W.J. 2001. Spatial distribution and sampling of *Aulacaspis yabunikkei* (Homoptera: Diaspididae) in camphor trees. Plant Protection Bulletin (Taichung) 43(2): 69-81. [HsuHoWu2001]

Notes: Dispersion patterns of varied stages generated by Iwao's patchiness regression and Taylor's power law for *Aulacaspis yabunikkei* Kuwana in different sampling units of camphor trees, *Cinnamomum camphora* (L.), were compared. Taylor's power law provided a consistently good fit to the data, whereas the fit of Iwao's patchiness regression were erratic, and the values of aggregation index of Taylor's power law (1.76 to 2.65) were narrower than those of Iwao's (1.26 to 11.83), but both indices ($b > 1.7$ and $\beta > 1.2$) indicate a clumped distribution pattern in all sampling units. Mean numbers of scales per leaf differed significantly ($P < 0.05$) between the lower and upper layer of the canopy, between old and young leaves, and between the underside and upper surface of leaves. The number of eggs corresponded closely to the total population, and this stage is best for precisely estimating the population. However, for the non-professional, the eggs are difficult to count. The number of female adult scale covers was easy to count and also corresponded very closely to the total population. Thus, female adult scale covers on the under leaf surfaces of old leaves were chosen as sampling targets to represent the scale population and for the decision making of pest management. Only scales with high density would damage camphor tree heavily, therefore, in fixed sampling plan, when there were 100 female scales on the undersides of leaves per twig in a tree, the optimum samples of 12 twigs per tree and 3 twigs per tree would reach 0.25 and 0.5 precision levels, respectively.

Hu, J.S., Sether, D., Melzer, M., Bustos, J., Perez, E., Kislan, M., Dawson, W. & Karasev, A. 2000. Is mealybug wilt of pineapple a viral problem? Phytopathology 90(6) (Suppl.): S92. [HuSeMe2000]

Notes: Mealybug wilt of pineapple (MWP) is one of the most serious diseases in pineapple (*Ananas* sp.). We have produced specific monoclonal antibodies against two distinct pineapple mealybug wilt associated viruses (PMWaV). A RT-PCR assay was developed to detect and distinguish these two viruses. The genome of PMWaV 2 has been cloned and its sequence determined. The genome is typical of the monopartite closteroviruses. Sequence analysis shows that PMWaV 2 shares the highest nucleic acid homology with GLRaV-3. PMWaV 1 has also been cloned and six kilobases of its 5'-end region sequenced. The two PMWaVs are distinct from each other and share less than 50% nucleic acid homology based on available sequences. PMWaV 1 has highest sequence homology with GLRaV 1. Both PMWaVs can be acquired and transmitted by mealybugs (*Dysmicoccus* spp.). We have shown in transmission experiments that the presence of both PMWaV and mealybug exposure is necessary for the induction of MWP. The presence of the PMWaV in the absence of mealybug feeding does not induce MWP symptoms.

Hua, L.Z. 2000. (In Chinese). In: , List of Chinese Insects (Vol. 1). Zhongshan University Press, Guangzhou, China. 448 pp. [Hua2000]

Notes: 1016 species are briefly reviewed from 16 Coccoidea families.

Hunter, M.S. & Woolley, J.B. 2001. Evolution and behavioral ecology of heteronymous aphelinid parasitoids. Annual Review of Entomology 46: 251-290. [HunterWo2001]

Notes: In almost all species of parasitic wasps in the Coccophaginae, a sub-family of Aphelinidae, males have host relationships different from females. In these "heteronymous" species, females are generally endoparasitoids of sternorrhynchous Hemiptera, such as scale insects, mealybugs, and whiteflies. In contrast, males may be hyperparasitoids, developing in or on conspecific females or other primary parasitoids. In other species, females are endoparasitoids of whiteflies, and males are primary endoparasitoids of eggs of Lepidoptera. Males and females may

both be primary parasitoids on the same species of scale insect hosts, but females develop as endoparasitoids, whereas males are ectoparasitoids. Here we review these life histories, focusing on examples of sexually dimorphic host relationships, development, and morphology. Coccophagine species may be sexual or parthenogenetic; we discuss reproductive modes and the interaction of sex ratio distorters with sex-specific host relationships. Sex allocation in the species in which males are hyperparasitoids involves choices of not what sex egg to lay, but whether to accept or reject a host of a given type; study in this area is reviewed as well as research in kin discrimination and ovicide. Last, we present the current understanding of phylogenetic relationships within this lineage and discuss hypotheses for the evolutionary origin of heteronomy in the Aphelinidae. Species mentioned include *Chrysomphalus aonidum*, *Coccus hesperidum*, *Coccus proteae*, *Lecanium* sp., *Parasaissetia* spp., and *Quadraspidiotus ostreaeformis*, *Saissetia oleae*.

Ismail, A.I. & Abdalla, E.F. 2001. Efficiency and residual activity of some selective compounds against *Asterolecanium pustulans* (*pustulans*?) Cock. and *Ceroplastes rusci* L. infesting fig trees. Annals of Agricultural Science (Cairo) 46(1): 355-364. [IsmailAb2001]

Notes: Field experiments were conducted in north Sinai, Egypt to evaluate some environmentally benign compounds (buprofezin, petroleum oils viz. Super Royal and kz oil, essential oils from *Salvia sclarea*, *Ocimum basilicum* and *Mentha viridis* (*Mentha spicata*) and chlorpyrifos) against certain pests infesting fig orchards, *Ficus carica*. The treatments were able to arrest the development of nymphs and consequently, the emerged females were significantly suppressed. The insect growth regulator, buprofezin was the most effective compound against the pustule scale insect, *A. pustulans* followed by *S. sclarea*, Super Royal and kz oils, where the reduction in infestation reached 62.3, 49.2, 47.5 and 46.0%, respectively, throughout the whole 3 months of experiment. Adding 2.5% *S. sclarea* oil to the lower concentration of buprofezin (0.025%) displayed potentiation effect that destroyed the waxy scale, *C. rusci* population by about 87.5% and slightly exceeded the respective value for chlorpyrifos (84.3%). It should be noted that *C. rusci* population was more susceptible to all treatments either applied individually or in mixtures, than *A. pustulans*.

Jablonska, A. & Bilinski, S.M. 2001. Structure of ovarioles in adult queens and workers of the common wasp, *Vespa germanica* (Hymenoptera : Vespidae). Folia biologica (Krakow) 49(3-4): 191-198. [JablonBi2001]

Notes: The ovaries of the common wasp, *Vespa germanica* are polytrophic-meroistic and consist of 2-3 (workers) or 7 (queens) ovarioles. Scale insects are also mentioned.

Jalali, S.K., Singh, S.P. & Biswas, S.R. 2000. Parasitisation behaviour of *Leptomastix dactylopii* Howard (Hymenoptera: Encyrtidae) at various densities of *Planococcus citri* Risso. Journal of Entomological Research. New Delhi 24(2): 159-162. [JalaliSiBi2000]

Notes: The response of the encyrtid parasitoid, *Leptomastix dactylopii* Howard, to various densities of its host mealybug, *Planococcus citri* Risso, was investigated in the laboratory. Percent parasitization decreased, and adult parasitoid emergence increased, with the increase in host density. Development of immature stages did not differ among different density levels. The percentage of female progeny was greater at lower densities. A positive correlation between density and the number of adults emerged, and a negative correlation between density and parasitization was observed. A parasitoid:host ratio of 1:100 was optimal for parasitoid use and mass production of *L. dactylopii*.

Jansen, M.G.M. 2000. The species of *Pulvinaria* in the Netherlands (Hemiptera: Coccoidea). (In English; Summary In Dutch). Entomologische Berichten (Amsterdam) 60: 1-11. [Jansen2000]

Notes: The occurrence of the species of the soft scale genus *Pulvinaria* in The Netherlands is discussed. Four species occur in the open, one is native (*Pulvinaria betulae* and three are introduced and established *P. floccifera*, *P. hydrangeae* and *P. regalis*. Two species are only known from interceptions during import inspections and from greenhouses (*P. mesembryanthemi* and *P. psidii*). A key to the species is given.

Jansen, M.G.M. 2001 (1999). An annotated list of the scale insects (Hemiptera: Coccoidea) of the Netherlands. Entomologica 33(1999): 197-206. [Jansen2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Sixty-six species of scale insects (Hemiptera: Coccoidea) have been recorded in The Netherlands up to August 1998. The species belong to 9 families, the most numerous of which are the

Coccidae (19 species), the Pseudococcidae (15 species) and the Diaspididae (15 species). Nine species are recorded here for the first time: *Matsucoccus matsumurae* (Kuwana), *Parthenolecanium rufulum* (Cockerell), *Phyllostroma myrtilli* (Kaltenbach), *Physokermes hemicyrphus* (Dalman), *Quadraspisiotus marani* Zahradnik, *Quadraspisiotus perniciosus* (Comstock), *Steingelia gorodetskia* Nassonov, *Trionymus aberrans* Goux and *Trionymus tomlinii* Green. *Carulaspis visci* (Schrank) must be removed from the list.

Japoshvili, G.O. 2001 (1999). The parasitoid complex and population dynamics of the plum scale, *Sphaerolecanium prunastri* Fonscolombe, in Georgia. Entomologica 33(1999): 403-406. [Japosh2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The plum scale, *Sphaerolecanium prunastri* Fonscolomb, is found infesting stone fruits all over the Europe and in most of the countries of Asia and North America. Its population dynamics and parasitoid complex in Georgia are described and the latter compared with that in other countries in southern Europe. The present rates of parasitism are compared with those of an earlier survey and it is noted that there have been some changes, both in the composition and in effectiveness of the primary and secondary parasitoids. The main primary parasitoids are still *Microterys hortulanus* Erdös and *Discodes coccophagus* (Ratzburg) but, among the secondary parasitoids, *Cerapterocerus mirabilis* Westwood is now the most important species. It was found that the economic importance of *S. prunastri* had become reduced due to a reduction in the number of secondary parasitoids and an increase in numbers of primary parasitoids.

Jashenko, R.V. 2000. [Historical information on the employment of coccid species of the genus *Porphyrophora* Brandt (Coccinea, Margarodidae) in the ancient carmine industry and medicine, the possibility of their use in ethnographic research.] (In Russian). Tethys Entomological Research 2: 17-24. [Jashen2000]

Notes: A review of the historical data on the employment of *Poryphyrophora* species in carmine industry and medicine is given.

Jeyarani, S., Sridharan, S. & Sadakathulla, S. 2000. Effect of steam distillate extracts of resistant rice varieties on rice mealybug. Insect Environment 6(1) 14-15. [JeyaraSrSa2000]

Notes: Solutions of the steam distillates of mealybug [? *Brevennia rehi*] resistant rice cultivars (IR36, IR64, IR72 and PtB21) were sprayed on the single tiller of the susceptible rice cultivar TN1 at 2000 ppm. Each plant was infested with 5 gravid mealybug females. Significantly fewer eggs were laid on plants treated with the distillates than on control plants. Toxicity tests on first instar nymphs revealed that the extracts of all cultivars were toxic, causing 54 to 68% mortality.

Johnson, C., Agosti, D., Delabie, J.H., Dumbert, K., Williams, D.J., Von Tscharnhaus, M. & Maschwitz, U. 2001. *Acropyga* and *Azteca* ants (Hymenoptera: Formicidae) with scale insect (Sternorrhyncha: Coccoidea): 20 million years of intimate symbiosis. American Museum Novitates (New York) No. 3335: 18 pp. [JohnsoAgDe2001]

Notes: Species of the genus *Acropyga* are rarely encountered subterranean ants that rely on mealybugs or aphids to provide their nutritional needs. Female *Acropyga* (Formicinae) alates of pantropical and Mediterranean species carry mealybugs with their mandibles while swarming and probably inoculate their new nests with these mealybugs. The natural history of *Acropyga* and other mealybug-tending ant species, a summary of the various reports of *Acropyga* and other mealybugs, and a new record from French Guiana are presented here. Also provided are a first report and description of *Acropyga* alates with mealybugs in Dominican amber dated to the Miocene, a discovery indicating that this intimate association and relatively uncommon behavior has existed for at least 15-20 million years. The mealybugs found with the *Acropyga* females in amber are related to the hypogaeic genera *Eumyrmecoccus* Silvestri and *Neochavesia* Williams & Granara de Willink (Pseudococcidae, Rhizoecinae) and represent three new species of a new genus. The genus *Electromymecoccus* and the species *Electromymecoccus abductus* Williams, *Electromymecoccus inclusus* Williams and Agosti, and *Electromymecoccus reginae* Williams are described. A piece of Dominican amber containing workers of *Azteca alpha* Wilson (Dolichoderinae) and 23 scale insects is also presented and the significance of these specimens in Dominican amber is discussed.

Joubert, P.H., Daneel, M.S., Grove, T., & Pichakum, A. 2000. Progress towards integrated pest management (IPM) on mangoes in South Africa. *Acta Horticulturae* No. 509: 811-817. [JouberDaGr2000]

Notes: [Proceedings of the Sixth International Symposium on Mango, Pattaya City, Thailand, 6-9 April, 1999, Volume 2.] In South Africa, several insect pests are important in the production of mangoes. The mango scale, *Aulacaspis tubercularis*, mango seed weevil, *Sternochetus mangiferae*, and the fruit flies *Ceratitis capitata*, *C. rosa* and *C. cosyra* are all key pests and have to be controlled regularly. For the biocontrol of mango scale, an *Aphytis* sp. parasitoid and a predatory beetle, *Cybocephalus binotatus*, were imported from Thailand and established in several areas. Up to 46.3% parasitism of the mango scale occurred, while *C. binotatus* dispersed to several orchards surrounding the original release sites. Fenthion, which is used to control mango seed weevil, is extremely toxic to beneficial insects and alternative control measures were evaluated. Several methods e.g. systemic insecticides and egg parasitoids proved to be non-viable and finally a softer insecticide viz. endosulfan 475 g/kg SC, was evaluated for registration. For fruit fly control, most producers refrain from using full cover sprays and more IPM compatible bait sprays are applied. A monitoring system was developed for the important pests and the more judicious use of insecticides now facilitates IPM on mangoes in South Africa.

Joyce, A.L., Hoddle, M.S., Bellows, T.S. & Gonzalez, D. 2001. Oviposition behavior of *Coccidoxenoides peregrinus*, a parasitoid of *Planococcus ficus*. *Entomologia Experimentalis et Applicata* 98: 49-57. [JoyceHoBe2001]

Notes: The encyrtid parasitoid, *Coccidoxenoides peregrinus* has been used as a biological control agent against the mealybugs *Planococcus citri* and *P. ficus*. This study examined the behavior and host selection of *C. peregrinus* attacking *P. ficus*. Adult parasitoids were fed a 0.1% solution of acridine orange, a DNA binding dye used to label *C. peregrinus* eggs. In a choice test, adult parasitoids were offered equal numbers of first through fourth instars of *P. ficus* and behavior of *C. peregrinus* was filmed and analyzed. Acridine orange labeled ova of the parasitoids found within mealybug hosts fluoresced green under fluorescence microscopy and presence of fluorescing eggs in hosts was used to determine oviposition events. A time budget prepared for *C. peregrinus* indicated that this parasitoid spent the majority of its time searching (71.53%) and grooming (15.06%). The average probing duration over all instars which led to oviposition from single visits was 4.93% +/- 0.62 s. A total of 35.51% of probes from all attacks led to ovipositions, whereas 33.72% of single visits to hosts resulted in ovipositions. Detection of fluorescing acridine orange labeled eggs showed all instars of *P. ficus* were acceptable for oviposition by *C. peregrinus*. There was a significant preference to probe second, third, and fourth instars rather than first instars of *P. ficus*. Host feeding was not observed for this parasitoid.

Karaca, I., Senal, D., Colkesen, T. & Özgökçe, M.S. 2001 (1999). Observations on the oleander scale, *Aspidiotus nerii* Bouché (Hemiptera: Diaspididae) and its natural enemies on blueleaf wattle in Adana Province, Turkey. *Entomologica* 33(1999): 407-412. [KaracaSeCo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The biology of *Aspidiotus nerii* Bouché and the overall efficiency of its natural enemies (the aphelinid parasitoid *Aphytus melinus* DeBach and the coccinellid predators *Chilocorus bipustulatus* (L.) and *Rhyzobius lophantae* (Blaisdell)) were studied. Forty leaves were collected at weekly intervals from 5 blueleaf wattle trees (*Acacia saligna*) from four compass bearings; all live and dead *A. nerii* and the number and stage of all parasitised scales were counted. There were two population peaks of *A. nerii* per year, in May/June and July/August. The number of parasitoids, however, fluctuated considerably, especially during the autumn and winter. The scale stage parasitised was primarily the adult female, followed by the pupae and then a few 2nd-instar nymphs. First-instar nymphs were never attacked by parasitoids but predators fed on all stages.

Karasev, A.V. 2000. Genetic diversity and evolution of closteroviruses. *Phytopathology* 90(6): S92. [Karasev2000]

Notes: The family Closteroviridae comprises more than 30 plant viruses with flexuous, filamentous virions and includes representatives with either mono- or bipartite positive strand ssRNA genomes. Large genomes of closteroviruses, up to 19.3 kb, have apparent resemblance to genomes of arteri- and coronaviruses. Closteroviruses are transmitted semi-persistently by insects from three families of Homoptera, in infected plants are associated with phloem tissue, and demonstrate an astonishing genetic diversity which suggests an extensive, on-going evolution. Evolution of closteroviruses seems to proceed through duplications, acquisition of new genes, sometimes of host origin, and their

subsequent diversification. Phylogenetic analyses of their replicative genes as well as the conserved HSP70 demonstrate that closteroviruses co-evolved with their insect vectors, resulting in three major lineages, i.e. aphid-, mealybug-, and whitefly-transmitted viruses. An amendment of the current classification will be discussed. Closteroviruses represent an ancient and diverse virus family which may pose threats to agriculture and needs serious attention.

Kaydan, M.B., Kozár, F., Yasar, B. & Erkiliç, L. 2001. Initial studies on Pseudococcidae fauna in Van Province of Turkey. *Acta Phytopathologica et Entomologica Hungarica* 36(3/4): 377-382. [KaydanKoYa2001]

Notes: Wild plants and cultivated crops from different habitats were surveyed and mealybug samples were collected from 1996 until 1998. Slides were prepared from these samples and nineteen species were identified, two of which had been previously identified. These species belonged to eight genera of the Pseudococcidae family. *Antonina graminis*, *Atrococcus ingidens*, *A. saxatilis*, *Euripersia amnicola*, *Helioecoccus bohemicus*, *H. saxatilis*, *Mirococcus inermis*, *Peliococcus bitubulatus*, *P. manifestus*, *P. terrestris*, *P. turanicus*, *P. unispinus*, *Phenacoccus affinis*, *P. karaberdi*, *P. tergrigorianae*, *Trionymus abberans* and *T. graminellus* are recorded in Turkey for the first time.

Kim, K.W. 2000. [Non-chemical or low-chemical control measures against key insect pests and rats in the ginseng fields] (In Korean; Summary In English). *Korean Journal of Applied Entomology* 39(4): 281-286. [Kim2000]

Notes: Non-chemical or low-chemical control measures against key insect pests and rats in the ginseng field were studied from 1993 to 1999, in Suwon, Korea Republic. Application of chemicals in ginseng fields during oviposition had similar control effects on the Korean black chafer, *Holotrichia diomphalia* adults. Ginseng damage by the African mole cricket, *Gryllotalpa africana* adults were reduced considerably by application chemicals beside the ginseng field. The larvae of wheat wireworm, *Ectinus sericeus*, were attracted to potatoes in the ginseng field. The spread of the mealybug, *Pseudococcus comstocki*, was very slow in the ginseng field, indicating that it is possible to eradicate the early colonies effectively. The rat repeller, Dekur 500S showed a significant control effect of rats in the ginseng field.

Knight, A.L., Christianson, B.A. & Unruh, T.R. 2001. Impacts of seasonal kaolin particle films on apple pest management. *Canadian Entomologist* 133(3): 413-428. [KnightChUn2001]

Notes: The impact of multiple applications of the kaolin-based particle him M96-018 on the population density of selected pests of apple, *Malus domestica* (Borkh) (Rosaceae), and their natural enemy populations were measured in several Washington State orchards from 1997 to 1999. Fruit infestation by San Jose scale, *Quadrastriotus perniciosus* (Comstock) (Hemiptera: Diaspididae), was significantly higher in treated plots than in untreated plots. No differences in pest densities occurred in plots treated for one versus two consecutive years.

Kosztarab, M. 2001 (1999). Status and future of human resources in coccidology. *Entomologica* 33(1999): 19-34. [Koszta2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] This paper reviews responses to a survey on the current status of researchers active in coccidology, with an emphasis on systematics but including work on morphology, biology, ecology, biological and chemical control of scale insects and on preparation of databases. The 39 responses provide a short assessment for 38 countries and 15 U.S. States, with the activities and/or whereabouts of about 243 researchers. Thirteen of the 32 active researchers (41%) will reach retirement age within five years; however, the average time to retirement for this group was 11.7 years. There has been a decline in the number of women in graduate training, while, from the 17 graduate students being trained in coccidology, only six are doing research in systematics.

Koteja, J. 2001. Essays on coccids (Hemiptera: Coccoidea). Paleontology without fossils? (In English; Summary In Polish). *Prace Muzeum Ziemi* No. 46: 41-52. [Koteja2001]

Notes: Only a few phylogenetic conceptions that consider time were proposed for the scale insects, and they have been critically reviewed on the basis of the currently available fossils. Evident pre-Cretaceous coccid fossils are still lacking. Scale insects appeared "suddenly" as a large and diverse group in early cretaceous.

Koteja, J. 2001a (1999). Fossil coccids do exist. *Entomologica* 33: 35-36. [Koteja2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Scale insects (Coccoidea) have been discovered in almost all Tertiary and Cretaceous amber and in a few other deposits, and the number of known coccid fossils has increased from about 100 to approximately 900 in the last twenty years. This material represents a variety of forms and constitutes a reliable basis for serious palaeo-entomological studies.

Koteja, J. 2001b. Essays on coccids (Hemiptera: Coccoidea): double function of Margarodid halteres. (In English; Summary In French). Annales de la Société Entomologique de France 27(3): 357-365. [Koteja2001b]

Notes: Direct observation of *Porphyrophora polonica* (L.) males showed that the margarodid halteres took part in reposing the wings, in addition to the role that they play in flight. This unusual behaviour is considered as an autapomorphie of the groundpearls which supports the view to treat them as a separate family, Margarodidae, distinct from other archeococcids.

Koteja, J. & Poinar, O. 2001. A new family, genus and species of scale insect (Hemiptera: Coccoidea: Kukaspidae, new family) from Cretaceous Alaskan amber. Proceedings of the Entomological Society of Washington 103(2): 356-363. [KotejaPo2001]

Notes: A new genus and species of scale insect, *Kukaspis usingeri* is described from Cretaceous Alaskan amber and placed in a new extinct family, the Kukaspidae. This fossil is a derived member of the superfamily Orthezioidea, with six pairs of unicorneal eyes forming lateral rows, a scutum with a large subrectangular membrane, a tubular scutellum separated from the mesopostnotum by a large membrane, wings narrow with a clear posterior (claval) flexing line, but a reduced anterior one, narrow parallel-sided halteres; a unique waxy tail consisting of four soft filaments arising from the last abdominal tergite and a penial sheath divided into basal capsul and stylus with a hook-like apex. Relationships of this peculiar Lower Cretaceous form with both extant and extinct forms are discussed.

Kotikal, Y.K. & Kulkarni, K.A. 2000. Incidence of insect pests of turmeric (*Curcuma longa* L.) in northern Karnataka, India. Journal of Spices & Aromatic Crops 9(1): 51-54. [KotikaKu2000]

Notes: A roving survey conducted during 1996-97 at three phases of crop growth in turmeric (*C. longa*) in northern districts of Karnataka, India revealed the incidence of major insect pests such as scale insects (*Aspidiotus curcumae*) in all the areas.

Kozár, F. & Foldi, I. 2001. Description of a new species of *Newsteadia* from Corsica, France (Hemiptera, Coccoidea, Ortheziidae). (In English; Summary In French). Nouvelle Revue d'Entomologie 18(92): 157-160. [KozarFo2001]

Notes: *Newsteadia susannae* sp. n. is described from Corsica (France), increasing the number of the *Newsteadia* species known from the region to four. The new species was found together with *N. floccosa* (De Geer), which is widely distributed in the palaearctic region. *N. susannae* differs from *N. floccosa* in details of the antennal setae, by possessing numerous quadrilocular pores, and by lacking division between the wax plate bands on the mid-dorsum. The samples also contained *N. floccosa*, *Ortheziola vejvodskyi* and *Arctorthelia cataphracta*.

Kozár, F. & Konczné Benedicty, Z. 2001. Revision of *Newsteadia* (Homoptera: Coccoidea) of the Nearctic and Neotropic regions, with descriptions of new species. Acta Phytopathologica et Entomologica Hungarica 36(1-2): 123-142. [KozarKo2001]

Notes: *Newsteadia borhidii* new sp., *N. brasiliensis* new sp., *N. costaricensis* new sp., *N. floridensis* new sp., *N. minima*, *N. morrisoni* new sp., *N. trisegmentalis*, *N. tristani*, and *N. tropicalis* new sp. are described and the new species are illustrated. Key to adult females of *Newsteadia* found in these regions is provided.

Kozár, F. & Konczné Benedicty, Z. 2001a. *Ortheziola* of Asia with the descriptions of three new species, and world distribution of the genus (Homoptera : Coccoidea, Ortheziidae). Acta Zoologica Academiae Scientiarum Hungaricae 47(1): 15-25. [KozarKo2001a]

Notes: Three new *Ortheziola* species (*O. peregovitsi*, *O. vietnamensis*, *O. matskasi*) are described from Asia. By these descriptions the number of the known *Ortheziola* species of the World increases to 23. Distribution records and

zoogeographical considerations are given. The new species represent a link between the Palaearctic, Oriental and Ethiopian Regions. The records gave a new insight into the species richness of this genus in the World.

Kozár, F. & Miller, D.R. 2000. World revision of *Ortheziola* Šulc (Homoptera: Coccoidea: Ortheziidae) with descriptions of eleven new species. Systematic Entomology 25: 15-45. [KozarMi2000]

Notes: Soil samples and museum collections were analysed from all zoogeographic regions of the world. From this material eleven new species of *Ortheziola* are described from Africa and the U.K., five additional species are redescribed and a key is presented for the identification of all sixteen species. A slightly modified concept of the genus is presented and several new characters are given as diagnostic of the genus. A phylogenetic hypothesis is given based on analysis of the morphological features of adult females. Results show that *Ortheziola* is most diverse in eastern Africa where relatively more advanced species occur. Basal species occur primarily in western Africa and Asia.

Kozár, F. & Miller, D.R. 2001 (1999). Observations on collecting scale insects (Hemiptera: Coccoidea). Entomologica 33(1999): 243-250. [KozarMi2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Scale insects have been primarily collected visually. Because scales are usually firmly attached to the host substrate, most mass-collecting techniques are ineffective. This paper provides information on the use of Berlese funnels, DVAC suction, pit-fall traps, sweeping, beating and screening for collecting scale insects and provides observations on how these methods compare with visual collecting methods.

Kozár, F. & Seprös, I. 2001. New scale insect pests (Homoptera: Coccoidea: Coccidae) on urban ornamentals. (In Hungarian; Summary In English). Növényvédelem 37(9): 441-444. [KozarSe2001]

Notes: Two important coccid species were found during this survey on urban ornamental plants: camellia scale (*Chloropulvinaria floccifera*) and hydrangea scale (*Eulpulvinaria hydrangea*). The latter species is new for the Hungarian fauna and both species are new on the list of the major scale insect pests. These species may attack various shrubs and trees, such as *Euonymus*, *Taxus*, *Celtis*, *Sophora*, *Aesculus*, *Acer*, *Tilia* and other ornamentals. Close monitoring of their distribution and population increases are recommended. *Pulvinaria regalis* is another species likely to occur.

Krasny, M.E. & di Gregorio, L.M. 2001. Gap dynamics in Allegheny northern hardwood forests in the presence of beech bark disease and gypsy moth disturbances. Forest Ecology and Management 144(1-3): 265-274. [KrasnyDi2001]

Notes: To determine changes in gap dynamics over a 6-year period in forests affected by beech bark disease (a disease complex of the scale insect, *Cryptococcus fagisuga*, and the fungi, *Nectria*) and gypsy moth infestations line transect surveys of gaps and gap makers were conducted in three Allegheny hardwood forests in central New York, USA. Gap makers were defined as any trees whose death or loss of > 50% of the branches caused an opening in the canopy, and were divided into three categories: decline (standing live trees with > 50% branch loss), standing dead, and treefall. Total land area in gaps increased significantly (P<0.00) from 19.7 to 31.9% during the 6-year study period. American beech (*Fagus grandifolia*) represented 52.4% of the gap makers in 1990 and 1996. Of the total beech gap makers, 30% were decline and 53% were treefall gap makers in 1990, but by 1996, only 8% were decline as compared to 76% treefall gap makers. In contrast, the majority of oak (*Quercus* spp.) gap makers were standing dead in 1990 and 1996. Although the rate of gap formation slowed at the end of this study, the predominance of beech in the subcanopy and regeneration layers pose persistent challenges for forest managers.

Kreiter, P., Dijoux, L., Donnadieu, F., Malausa, J.C. & Quilici, S. 2000. [Tentative introduction of *Arrhenophagus chionaspidis* (Hymenoptera, Encyrtidae) into the Alpes-Maritimes for control of the white peach scale.] (In French; Summary In English). Bulletin Mensuel de la Société Linnéenne de Lyon 69(6): 121-126. [KreiteDiDo2000]

Notes: [Original title: Tentative d'introduction dans les Alpes-Maritimes de la souche réunionnaise d'*Arrhenophagus chionaspidis* (Hymenoptera, Encyrtidae) pour lutter contre la Cochenille blanche du mûrier.] This parasitoid on *Pseudaulacaspis pentagona* has been introduced from Reunion Island to the Alpes-Maritimes. Biological characteristics are discussed.

Kubiriba, J., Legg, J.P., Tushemereirwe, W. & Adipala, E. 2001. Disease spread patterns of Banana streak virus in farmers' fields in Uganda. *Annals of Applied Biology* 139(1): 31-36. [KubiriLeTu2001]

Notes: Three surveys were conducted to establish the disease spread patterns of Banana streak virus (BSV) in farmers' fields in Uganda. Transects were traced both across the fields and from infection foci within a field. BSV incidence in adjacent quadrants was also determined to quantify statistically the spatial relationships of infected plants in the fields. Severity assessment along transects across fields revealed clusters of plants with moderate to high severity and clusters of plants with no BSV or low severity. Symptom severity decreased away from foci of infection ($b = -0.014$; $P = 0.0081$). Observed frequency of infected quadrant counts differed from corresponding expected frequency of infected quadrant counts (Poisson's distribution, chi (2); p less than or equal to 0.01). BSV-infected plants, therefore, were aggregated in well-established fields. Aggregation of infected plants in farmers' fields and the decrease of severity away from infection foci suggest the likely involvement of a slow moving vector (mealybugs) in BSV transmission.

Kubiriba, J., Legg, J.P., Tushemereirwe, W. & Adipala, E. 2001a. Vector transmission of Banana streak virus in the screenhouse in Uganda. *Annals of Applied Biology* 139 (1): 37-43. [KubiriLeTu2001a]

Notes: Although mealybug transmission of Banana streak virus (BSV) by *Planococcus citri* and *Saccharicoccus sacchari* has been demonstrated elsewhere, these mealybugs have not been identified on bananas in Uganda and their role and that of other agents in BSV transmission is not well documented. Insect samples were collected from banana farms in sites with low, moderate and high BSV infections in Uganda. Subsequently, live mealybugs and aphids were again collected and used in acquisition, retention and transmission tests, and BSV diagnosed using TAS-ELISA. *Dysmicoccus brevipes* (pineapple mealybug), *S. sacchari* (sugarcane mealybug) and *Pentalonia nigronervosa* (banana aphid) were the most abundant insect species from banana fields sampled. Abundance of *D. brevipes* was positively and significantly correlated with BSV incidence unlike that of *P. nigronervosa*. Transmission studies in the screenhouse showed that mealybugs acquired BSV one day after feeding on virus sources and approached optimum acquisition after the third day. Pineapple and sugarcane mealybugs retained BSV up to 5 days from the day of transfer from the virus source. BSV was first detected in the recipient banana plants 4 wk after transmission using pineapple mealybug and 6 wk after inoculation using sugarcane mealybug. Under screenhouse conditions, both mealybugs therefore appear to transmit BSV semipersistently.

Kunca, A., Zubrik, M. & Leontovyc, R. 2000. Contribution to the knowledge of beech bark disease in the Magura working-plan area, West Carpathian mountains. (In English; Summary In Slovakian). *Lesnický Casopis* 46(1):59-67. [KuncaZuLe2000]

Notes: Occurrence of beech bark necrosis, the beech scale insect (*Cryptococcus fagi* [*Cryptococcus fagisuga*]) and feeding by larvae of the butterfly *Ectoedemia liebwerdella*, and several site attributes, were evaluated for 1163 beech (*Fagus sylvatica*) trees in a 1800 ha area at Strazovskych in the West Carpathian region of Slovakia. The influence of the various factors measured on the occurrence of beech bark necrosis was analysed. Neither the beech scale insect nor feeding by *E. liebwerdella* larvae had a significant influence on the presence of bark necrosis. Unfavourable site conditions, such as shallow soils, steep slopes and south to east exposures had some influence on the occurrence of the disease.

Lagowska, B. 2000. *Puto superbus* (Leonardi, 1907) (Homoptera: Pseudococcidae) new to the Polish fauna. *Polskie Pismo Entomologiczne* 69: 3-6. [Lagows2000]

Notes: *Puto superbus* (Leonardi) is recorded for the first time from Poland. It represents the second indigenous species to Poland in the genus. Data on distribution, host plants and life history are given.

Lagowska, B. 2000a. [The scale insects (Homoptera, Coccoidea) of ornamental coniferous plants in Poland: pest status and control.] Proceedings of the XVth Czech and Slovak Plant Protection Conference 379-380. [Lagows2000a]

Notes: [Conference held in Brno, September 12-14, 2000.] Nine species belonging to three families are listed. Four species are economically important: *Parthenolecanium fletcheri* and *P. pomeranicum* (Coccidae), *Carulaspis juniperi* (Diaspididae) and *Planococcus vovae* (Pseudococcidae). Plant hosts, biological and life history notes, and suggestions for chemical control are included.

Lagowska, B. 2001. Morphological variation in adult female *Coccus hesperidum* L. (Hemiptera: Coccoidea: Coccidae) in Poland. Entomologica 33: 105-112. [Lagows2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] This paper compares the variation of ten morphological characters of adult female *C. hesperidum* L. collected off (i) five different host plants and (ii) the stems, petioles and both leaf surfaces of *Citrus*, all from glasshouses in Poland. Four measured and six meristic characters were selected for biometric study. The mean and range of each of these characters varied between host plant species and with their position on *Citrus*. The main characters which varied between host species were the size and shape of the dorsal setae and the distribution and frequency of dorsal and ventral tubular ducts. Specimens off different parts of *Citrus* varied mainly in the frequency of the dorsal tubular ducts and the spiracular disc-pores. Pocket-like sclerotisations were noted for the first time in *C. hesperidum*; when present, they were in the stigmatic areas, close to a dorsal tubercle.

Lagowska, B. & Gawłowska, J. 2001. [Scale insect damage on *Thuja* and yew trees.] (In Polish; Summary In English). Ochrona Roslin 45: 1-2, 36-36. [LagowsGa2001]

Notes: [Original title: Szkodliwość miseczników na tujach i cisach.] Three species of scale insect attacking ornamental trees and shrubs in Poland, are described: *Parthenolecanium fletcheri* (occurring most frequently on *Thuja* and yew), *P. corni* and *P. pomeranicum* (common on yew). The life cycle of each pest and the most effective methods of control are described.

Lambdin, P.L. 2001. Morphology of the second instars of *Polea martini* and *Polea selangorae* (Coccoidea: Asterolecaniidae). Entomological News 112(3): 167-172. [Lambdi2001]

Notes: The second instars of the pit scales (Asterolecaniidae) *Polea martini* and *P. selangorae* are described and illustrated with measurements included for the various morphological structures. Both species were collected on species of *Calophyllum* sp. from Borneo and Singapore, respectively. These species are morphologically similar to immatures of *Grammococcus* in the New World. *Polea martini* is distinguished from *P. selangorae* by the presence of an anal ring with 6 setae, more multilocular pores in the dorsal pore clusters, and differences in the tubular ducts.

Lambdin, P.L. & Joshi, P.A. 2001. Haemocytes of three scale insect species: *Phenacoccus gossypii* Townsend & Cockerell, *Pseudococcus longispinus* (Targioni Tozzetti) and *Dactylopius confusus* (Cockerell) (Hemiptera: Coccoidea). Entomologica 33: 113-117. [LambdiJo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] An evaluation of the haemocytes in the cochineal scale, *Dactylopius confusus* (Cockerell), was completed and compared with those found in the mealybugs *Phenacoccus gossypii* Townsend & Cockerell and *Pseudococcus longispinus* (Targioni Tozzetti) to assess the potential sites of the dye pigment source. Four basic cell types were found in the two pseudococcids and five in the cochineal scale. The cell types common to all species included: prohaemocytes, oenocytoids, typical granulocytes and plasmacytodes. In addition, a modified granulocyte (poly-glyco-based granulocyte) was found to be specific to the cochineal scale and this produced rough endoplasmic reticulum derived granules that may be the source for the synthesis of carminic acid.

Lambdin, P.L. & Podsiadlo, E. 2001. Descriptions of the first instars of *Lecanodiaspis brookesiae* and *L. crassispina* (Coccoidea: Lecanodiaspididae). Entomological News 112(5): 287-293. [LambdiPo2001]

Notes: The first instars of *Lecanodiaspis brookesiae* and *L. crassispina* from Australia are described and illustrated. *Lecanodiaspis brookesiae* is distinguished by the presence of fleshy anterior and posterior spiracular setae, ten labial setae, and two setae on the anal plates, while *L. crassispina* is differentiated from other species of *Lecanodiaspis* by fleshy anterior and spine-like posterior spiracular setae, ten labial setae, and three setae on the anal plates. A modified key is provided to separate these species from other known species in this taxon.

Latta, S.C., Gamper, H.A. & Tietz, J.R. 2001. Revising the convergence hypothesis of avian use of honeydew: evidence from Dominican subtropical dry forest. Oikos 93(2): 250-259. [LattaGaTi2001]

Notes: A honeydew-producing scale insect (family Margarodidae, tribe *Xylococcini*, genus *Stigmacoccus*) was found associated with the tree *Bursera simaruba* in subtropical dry forests at elevations of 100-400 m on the south side of the

Sierra de Bahoruco, Pedernales Province, Dominican Republic. At two study sites, 91% of Burseia trees supported locally dense populations of Margarodidae. Fifteen species of birds were observed foraging on the honeydew, but most observations were of the winter resident Cape May warbler (*Dendroica tigrina*) and black-throated blue warbler (*D. caerulescens*), and the permanent resident bananaquit (*Coereba flaveola*) and black-crowned palm tanager (*Phaenicophilus palmarum*). The Cape May warbler actively defended the honeydew resource but frequency of use of honeydew was influenced by the close presence of flowering agave and scale insect density. Data suggest that honeydew may be a critical component of the diet of this species especially during the late winter dry-season. Hymenopteran insects also were observed feeding on honeydew, but rates of consumption did not approach that of avian species. The occurrence of this phenomenon in Dominican dry forest is discussed in light of the convergence hypothesis of bird use and defense of homopteran honeydew in which it is proposed that birds are able to maintain relationships with scale insects in moist, warm temperate forests because it is in these climates where ant abundance is low. We suggest that our observation of a well-developed bird-homopteran system in classic subtropical dry forest supports the proposed mechanism of reduced competition with ants allowing bird use of honeydew, but we suggest that a broader array of especially insular habitats which may be relatively depauperate in terms of ants also can be expected to support bird-homopteran systems.

Le Ru, B. & Makosso, J.P.M. 2001. Prey habitat location by the cassava mealybug predator *Exochomus flaviventris*: Olfactory responses to odor of plant, mealybug, plant-mealybug complex, and plant-mealybug-natural enemy complex. *Journal of Insect Behavior* 14(5): 557-572. [LeRuMa2001]

Notes: *Exochomus flaviventris* Mader is considered to be the most active predator of the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero in Central Africa. The response of experienced gravid female coccinellids to the odor of cassava plant (var. Zanaga), unparasitized mealybugs, plant-mealybug complex with or without feeding prey (parasitized or not), and plant-mealybug complex with or without conspecific coccinellids was investigated in a Y-tube olfactometer. The odor of uninfested cassava plants was not more attractive than clean air. Dual-choice tests revealed that mealybug-infested plants were preferred to mealybugs alone and mealybug-damaged plants and were the major sources of volatiles that attract female coccinellids to the microhabitat of its prey. The emission of volatile chemicals did not appear to be limited to the infested parts of the plant but did occur systemically throughout the plant. The presence of conspecific coccinellid larvae or adult males did not modify the attractiveness of the mealybug-infested plants. However, when an infested plant with conspecific predator females (alone or with conspecific males) was compared to an infested plant or infested plant with conspecific males, *E. flaviventris* females showed a preference for the last two sources of odor. The infested plant with conspecific males was also preferred to the uninfested plant with conspecific females. In addition, the odor of conspecific males was preferred to that of conspecific females. Female predators preferred the plant infested with unparasitized mealybugs to the plant infested with mealybugs previously parasitized. These results showed that *E. flaviventris* females use herbivore-induced plant volatiles during foraging and can detect via olfaction the presence of conspecific gravid females and parasitized prey, thus assessing patch suitability from a distance.

Lima, I.M.M. & Gama, N.S. 2001. [Record of host plants (Cactaceae) and new dissemination strategy of *Diaspis echinocacti* (Bouche) (Hemiptera: Diaspididae), Prickly-Pear-Scale, in the states of Pernambuco and Alagoas, Brazil] (In Portuguese). *Neotropical Entomology* 30(3): 479-481. [LimaGa2001]

Notes: [Original title: Registro de Plantas Hospedeiras (Cactaceae) e de Nova Forma de Disseminação de *Diaspis echinocacti* (Bouche) (Hemiptera: Diaspididae), Cochinilha-da-Palma-Forrageira, nos Estados de Pernambuco e Alagoas.] *Opuntia ficus-indica* and *Nopalea cochenillifera* (Cactaceae) are alternative food sources for cattle in drought areas of the Northeastern Region of Brazil. *Diaspis echinocacti* (Bouche) is the unique pest of these Cactacea species and it was previously detected on the following native host plants: *Cereus jamacaru*, *Melocactus* sp., *Opuntia dillenii* and *O. inamoena*. The new record of native hosts are *Cereus gounellei*, *C. squamosus* and the exotic *C. hildemannianus* from drought areas; *Pereskia grandifolia* and *Epiphyllum oxypetalum*, native species from tropical forest used as ornamental plants. *D. echinocacti* has not infested *O. monacantha* in the field and in laboratory bioassays. The dissemination of the neonate scale insect transported on the body surface of the predators *Chilocorus nigrita* and *Zagreus bimaculosus* Coccinellidae: Chilocorinae) was recorded for the first time.

Lin, T., Liu, K.Y., Liu J.X., Xiao, F., Deng, L.W., Yan, S.C., Li, F.R. & Li, C.D. 2000. [The population dynamics and prediction technique of *Lepidosaphes salicina*.] (In Chinese; Summary In English). Journal of Northeast Forestry University 28(6): 52-54. [LinLiLi2000]

Notes: A periodic systematic survey of the death rate of the first instar settled nymphs, pupae and adult females as well as the development progress of the newly hatched nymphs, second instar nymphs, prepupae and pupae was performed in Hongqi Forest Farm of Daqing City, Heilongjiang Province.

Lit, I.L. & Gullan, P.J. 2001. Comparative morphology of the anal tubercle and associated structures of some lac insects (Hemiptera: Coccoidea: Kerriidae). Entomologica 33: 119-126. [LitGu2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Specimens of *Austrotachardia acaciae* (Maskell), *Austrotachardia* sp. ex *Cassinia* spp., *Kerria lacca* (Kerr) and *Paratachardina decorella* (Maskell) were examined under the scanning electron microscope (SEM). SEM images were compared with observations under the light microscope. The anal tubercles and associated structures of each species are described and compared. The presence of what appears to be vestiges of an anal cleft in *Paratachardina* is interpreted as suggesting the possible evolution of the lac insects from a lecanoid ancestor that possessed an anal cleft. The results provide an easier interpretation of these characters under the light microscope.

Lit, I.L., Caasi-Lit, M. & Talidong, C.V. 2001 (1999). The production of long anal filaments by the bamboo node mealybug, *Antonina* sp. (Hemiptera: Coccoidea: Pseudococcidae), as a response to lack of attending ants. Entomologica 33(1999): 311-316. [LitCaTa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Bamboo node mealybugs, *Antonina* spp., in the absence of attending ants, were observed to produce long waxy filaments both in the field and in the greenhouse. In contrast, ant-attended mealybugs had only very short filaments or none at all. Ant exclusion experiments confirmed the field observations. The available data suggest that the long filaments are an adaptation for the dispersal of honeydew in the absence of solicitous ants, so as to avoid drowning in the accumulating honeydew or suffocation due to development of sooty moulds.

Liu, J.X., Liu, K.Y., Lin, T., Wang, H.Y. & Liu, D.Y. 2000. [Regulations of the outbreak of *Lepidosaphes salicina*.] (In Chinese; Summary In English). Journal of Northeast Forestry University 28(6): 48-51. [LiuLiLi2000]

Notes: Distribution of *L. salicina* on their hosts is discussed. The death rate was high in hot summers and severe winters. Investigation of the relationship between the occurring area of oyster scale and meteorological factors such as humidity and temperature in ten cities and counties in Heilongjiang province formed a multiple linear regression model for the prediction of the occurring area of oyster scale. Acarids, ladybeetles, parasitic wasps and parasitic flies were found to be natural enemies.

Liu, S.Q. & Xu, H.Z. 2000. [Integrated control and characteristics of the main poplar diseases and insect outbreaks in Siyang County.] (In Chinese; Summary In English). Journal of Jiangsu Forestry Science and Technology 27(6): 33-35. [LiuXu2000]

Notes: The characteristics and integrated control are briefly discussed of the 2 fungal diseases and 5 insect pests of poplars [*Populus*] found in Siyang County, Jiangsu Province, China. Among the insect pests is *Drosicha corpulenta*.

Lizaso, M.T., Moneo, I., García, B.E., Acero, S., Quirce, S. & Tabar, A.I. 2000. Identification of allergens involved in occupational asthma due to carmine dye. Annals of Allergy, Asthma & Immunology 84(5): 549-552. [LizasoMoGa2000]

Notes: Carmine has been implicated as an etiologic agent of occupational asthma, but the allergens involved have not been yet identified. An in vitro study based in SDS-PAGE and IgE immunoblotting with carmine and cochineal extracts was performed. Sera from three carmine dye workers diagnosed with occupational asthma induced by carmine dye and from seven nonatopic subjects were used. Three proteins of around 30, 28, and 17 kD in raw cochineal extract and another protein of 50 kD in the boiled one were demonstrated by SDS-PAGE. Two proteins of around 50 and 28 kD

were observed in the carmine extract by the same technique. Specific IgE binding bands at 17 kD in cochineal raw extract, at 50 kD in the boiled one, and at 28 kD in carmine extract were demonstrated by IgE immunoblotting. We have identified three allergens of around 17, 28, and 50 kD implicated in occupational asthma of three carmine workers.

Lo, P.L. & Chapman, R.B. 2001. Predation by *Halmus chalybeus* (Coleoptera: Coccinellidae) on *Ceroplastes destructor* and *C.sinensis* (Hemiptera: Coccoidea: Ceroplastinae) infesting citrus in Northland, New Zealand. Biocontrol Science and Technology 11(1): 57-66. [LoCh2001]

Notes: Predation by *Halmus chalybeus* (steelblue ladybird) on two species of wax scale was studied on citrus orchards in Northland, New Zealand. Field experiments using an exclusion technique of enclosing citrus branches in bags, found that larval and adult *H. chalybeus* preyed on first and second instars of both *Ceroplastes destructor* (white wax scale) and *C. sinensis* (Chinese wax scale), but not third instar *C. destructor*. Third instar *C. sinensis* and adults of both species were not tested but are rarely, if ever, attacked by *H. chalybeus*. The sampling of scale and ladybird populations and Weld experiments showed that few scales of either species survived past the second instar stage where *H. chalybeus* was numerous. The feeding rate of *H. chalybeus* on settled first and second instar scales was estimated inside bagged branches. Adults consumed on average 15.6 *C. destructor* and 13.3 *C. sinensis* per day per ladybird, while larvae ate 9.7 *C. destructor* per day. These feeding rates accounted for the experimental reduction of scale populations. *H. chalybeus* is a useful natural enemy for the control of *C. destructor* and *C. sinensis* when its activity is not disrupted by pesticides.

Longo, S., Marotta, S., Pellizzari, G., Russo, A. & Tranfaglia, A. 2001. A zoogeographical analysis of the Italian scale insect fauna. Entomologica 33: 229-230. [LongoMaPe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. The results of a zoogeographical analysis of the Italian scale insect fauna, which currently includes 365 species were presented. Eleven species were included in the analysis, either because they were poorly described and were therefore of doubtful identity or because they had not been recorded since their original description. This analysis divided the Italian scale insect fauna into three major groups according to the distributional patterns currently used in faunistic studies in the Western Palaearctic Region: A) Species primarily of the Western-Palaearctic Region (226 species). This group included the following sub-groups: i) species widely distributed in the Holarctic region (115 spp.); ii) species widely distributed in Europe (52 spp.); iii) species widely distributed in the Mediterranean Basin (57 spp.), and iv) Afrotropical or Oriental species also present in the Mediterranean area (2 spp.). B) Cosmopolitan species or cultural immigrants (111 spp.). C) Endemic species (17 spp.). Each major group or sub-group included several species which had a more restricted distribution pattern. The analysis revealed that the Italian scale insect fauna (with the exclusion of the cosmopolitan species, which are of little zoogeographical interest), was represented mainly by widely distributed species in the Holarctic region (31.5% of total scale fauna); those which were widely distributed in the Mediterranean Basin (15.6%) and those widely distributed in Europe (14.25%). The Afrotropical or Oriental species represented only 0.5% of the total. A brief comment on each group was given.

Lorenzo Fernández, J.M., Prendes Ayala, C. & Lorenzo Bethencourt, C.D. 2001. [Following of populational dynamic of *Dysmicoccus grassii* (Leonardi) in *Musa acuminata* Colla. Subgroup Cavendish cv. Petit naine.] (In Spanish). Boletín de Sanidad Vegetal, Plagas 27(1): 85-101. [LorenzPrLo2001]

Notes: [Original title: Seguimiento de la dinámica poblacional de *Dysmicoccus grassi* (Leonardi) (Homoptera: Pseudococcidae) en *Musa acuminata* Colla, subgrupo cavendish cv. Pequeña enana.] The optimum number of plants was determined for estimating the extent of *D. grassii* infestation. Maximum and minimum temperatures and relative humidity discussed in relation to the persistence and recurrence of this pest.

Lotfalizadeh, H. & Ahmadi, A.A. 2000. Natural enemies of cypress tree mealybug, *Planococcus vovae* (Nasonov), and their parasitoids in Shiraz, Iran. (In English; Summary In Persian). Iran Agricultural Research 19(2): 145-154. [LotfalAh2000]

Notes: In a survey conducted in 1998, 15 species of natural enemies attacking cypress tree mealybug, *Planococcus vovae* were found in Shiraz, Iran. These included two parasitoids, *Anagyrus pseudococci* and *Dusmetia fascipennis*. The most common predators included *Exochomus* spp., *Hyperaspis polita*, *Nephush bipunctatus*, *Chrysoperla carnea*,

Suarius fedtschenkoi, *Dicrodiplosis manihoti* Harris and *Geocoris quercicola*. The effectiveness of these natural enemies was reduced by the hyperparasitoids, *Marietta picta* and *Chartocerus* spp., by the parasite *Homalotylus ephippium* attacking coccinellids, and by the parasites *Cheiloneurus ceroplastis*, *Ooencyrtus kuvanae*, *Isodromus atriventris*, *I. aff. vinulus*, *Catolaccus crassiceps* and *Pachyneuron concolor* [*P. muscarum*] attacking chrysopids.

M'Hamed, T.B. & Chemseddine, M. 2001. Assessment of temperature effects on the development and fecundity of *Pullus mediterraneus* (Col., Coccinellidae) and consumption of *Saissetia oleae* eggs (Hom., Coccoidea). Journal of Applied Entomology 125(9-10): 527-531. [MHamedCh2001]

Notes: Eggs, larval and nymphal periods and fecundity of *Pullus mediterraneus* were examined under 16 h light : 8 h dark combined with six constant temperatures: 15, 20, 25, 30, 35 and 40 degrees C. Eggs of *Saissetia oleae* were used as prey. The developmental time at 15, 20, 25, 30 and 35 degrees C was 17.23, 4.5, 2.64, 1.67, 1.28 days for eggs and 98.47, 68.88, 53.94, 28.96, 36.51 days for larval-pupal duration, respectively. At 7 degrees C no eggs hatched, and at 40 degrees C all the stages died after 36 h of maximum exposure except the three last stages. The fecundity of females rearing at different temperatures ranged between 1.7 eggs at 15 degrees C and 601.86 eggs at 30 degrees C. The pre-oviposition period ranged between 23.75 days at 15 degrees C and 3.47 days at 35 degrees C. The consumption of *S. oleae* eggs by the larvae reached 597.69 eggs during the pre-imaginal development. Females attacked more eggs than males averaging 77.69 +/- 22.34 eggs per 4 day period compared with 46.97 +/- 10.12 eggs per 4 day period for males.

Mahmoud, F.A., Hamdy, M.K. & Hegazi, A.G. 2001 (1999). Antimicrobial activity of secretory materials of some scale insects. Entomologica 33(1999): 441. [MahmouHaHe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. The antimicrobial activity of the secretory materials associated with the test or wax covers of five scale insects was tested for Gram-positive and Gram-negative bacteria. The scale insects studied were the margarodid *Icerya aegyptiaca* (Douglas), the soft wax scale *Ceroplastes rusci* (Linnaeus) and three hard scales: *Aonidiella aurantii* (Maskell), *Lepidosaphes beckii* Nerwman and *Parlatoria zyziphi* (Lucas). The Gram-positive bacteria found included *Staphylococcus aureus* and *Streptococcus agalactia*, while the Gram-negative bacteria included *Escherichia coli*, *Pseudomonas aeruginosa* and *Corynebacterium pseudotuberculosis*. The results of these observations revealed that there was some highly significant antimicrobial activity associated the secretory materials of the diaspidids *A. aurantii*, *L. beckii* and *P. zyziphus*. The antimicrobial activity observed varied according to type of the pathogenic bacteria it was used against. Thus, the activity from all three species was effective against *Staphylococcus aureus*, but that of *A. aurantii* and *P. zyziphus* was less effective against *Corynebacterium pseudotuberculosis*.

Malsch, A.K.F., Kaufmann, E., Heckroth, H.-P., Williams, D.J., Maryati, M. & Maschwitz, U. 2001. Continuous transfer of subterranean mealybugs (Hemiptera, Pseudococcidae) by *Pseudolasius* spp. (Hymenoptera, Formicidae) during colony fission? Insectes Sociaux 48: 333-341. [MalschKaHe2001]

Notes: In west- and east-Malaysian lowland rainforests, three *Pseudolasius* spp. are found in trophobiotic relationship with a total of eight scale insect species in six genera feeding at the roots of plants. Intimate associations going beyond pure trophobiosis could be discovered with five species of root mealybugs: *Planococcoides* sp., *Maconellicoccus multipori* and three species of *Rhizoecus*. All three *Pseudolasius* species carry their pseudococcids when disturbed, during nest movements and to feeding sites. Moreover, the *Pseudolasius* species discussed permanently keep adults and immature instars of their mealybug partners within their nests.

Malumphy, C. 2001. Scale insects (Hemiptera, Coccoidea) intercepted on imported plant material and recent introductions in England and Wales. Entomologica 33: 230. [Malump2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. There have been almost 300 species of Coccoidea intercepted on imported plants and plant produce in England and Wales since 1968, which is more species of Coccoidea intercepted than any other superfamily of invertebrates. For example, in 1995, a third of all species intercepted on imported plant material were Coccoidea. This makes scale insects the most significant superfamily of invertebrates being dispersed in the international plant trade, in terms of numbers of species. The most frequently intercepted species are

listed and the reasons why they are so commonly transported briefly discussed. Despite the large number of exotic scale insects entering Britain very few have become established and even fewer have become widespread. New introductions of exotic species reported in non-commercial premises in Britain since 1968 are also listed. Finally, recent outbreaks of exotic pest species at commercial nurseries are given, all of which have been successfully eradicated.

Mani, M. & Krishnamoorthy, A. 2000. Predatory Potential and Development of the Australian Ladybird Beetle, *Cryptolaemus montrouzieri* Muls. on the Spiralling Whitefly, *Aleurodicus dispersus* Russel. Entomon 24(2): 173-176. [ManiKr2000]

Notes: The Australian ladybird beetle *Cryptolaemus montrouzieri* Muls. was found commonly preying on the spiralling whitefly, *Aleurodicus dispersus* Russel in South India. Predatory potential and development of the larvae of *C. montrouzieri* was studied on the nymphs of the spiralling whitefly. The duration of first, second, third and fourth instar larva of *C. montrouzieri* was found to be 4.10, 2.20, 4.50 and 6.40 days respectively when they were fed with *A. dispersus*. The predator had completed its larval development in 17.20 days on the whitefly. The number of whitefly nymphs consumed during first, second, third and fourth larval instar of *C. montrouzieri* averaged to 23.50, 47.85, 74.60 and 149.80 respectively. The predator consumed a total of 290.75 nymphs during the entire larval development. The predator is being evaluated for its potential in the suppression of the spiralling whitefly under field conditions.

Marotta, S. & Franco, J.C. 2001 (1999). Is the genus *Lusitanococcus* Neves a junior synonym of *Cucullocooccus* Ferris (Hemiptera: Coccoidea: Pseudococcidae)? Entomologica 33(1999): 127-131. [MarottFr2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The genus *Lusitanococcus* was established by Neves in 1954 to include *arrabidensis*, a new species of mealybug collected in Portugal on *Erica arborea* and *E. lusitanica*. Later, on the basis of the original illustration and description, some workers considered that *Lusitanococcus* was a subjective synonym of *Cucullocooccus* Ferris, 1941, while others considered it a valid genus. Specimens were collected in the topotypic locality in Portugal off the same species of host plant and compared with the type specimens of *Lusitanococcus arrabidensis* Neves and with *C. vaccinii* Ferris, the type species of *Cucullocooccus*. From this study, we have concluded that: (i) the genus *Lusitanococcus* is a junior subjective synonym of *Cucullocooccus*, and that (ii) *arrabidensis* is a valid species. Some points with regard to generic characters of *Cucullocooccus* are discussed.

Marotta, S. & Transfaglia, A. 2001 (1999). A new morphological structure on *Kermes vermilio* (Planchon) (Hemiptera: Coccoidea: Kermesidae). Entomologica 33(1999): 133-138. [MarottTr2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Kermes vermilio* (Planchon) is a common scale insect living on *Quercus ilex* L. in urban environments in Southern Italy. Morphological studies on the nymphs and prepupae showed the presence of a pair of membranous ventral frontal lobes, situated just antero-medially to each basal antennal segment. Similar lobes are only currently known in the family Eriococcidae. These structures are therefore here recorded in the Kermesidae for the first time, although it is thought probable that they are present on other species of the family. Their function is unknown.

Maschwitz, U., Dorow, W.H.O., Schellerich-Kaaden, A.L., Buschinger, A. & Azarae, H.I. 2000. *Cataulacus muticus* Emery 1889 a new case of a Southeast Asian arboreal ant, non-mutualistically specialized on giant bamboo (Insecta, Hymenoptera, Formicidae, Myrmicinae). Senckenbergiana Biologica 80(1-2): 165-173. [MaschwDoSc2000]

Notes: *Cataulacus muticus* Emery 1889 was found frequently in the Gombak Valley on the Malay Peninsula nesting exclusively in living culms of giant bamboo, mostly *Gigantochloa scorchedii* Gamble 1896. Big monogynous colonies were polydomously distributed in internodes of large living culms, whereas young colonies with a few workers were found in thin bamboo side branches of the crown region. The colonies, which could comprise more than 2100 workers, occupied culm internodes often opened by pyralid caterpillars but also by other insects. Most but not all natural colonies tended *Kermicus wroughtoni* Newstead 1897 (Sternorrhyncha: Pseudococcidae) as endophytic trophobionts in the nest internode. In the newly founded colonies these mealybugs were lacking and also not all internodes of mature colonies contained mealybugs. In field and laboratory experiments it could be proven that workers of *C. muticus* do not transport mealybugs to newly occupied nest internodes during colony expansion or nest relocation. Further details of the

sociobiology of *C. muticus* are reported: non-trophobiotic nutrition, diurnality and swarming behavior. The ants are able to keep their internodes free from water influx not only by entrance blocking with their heads but also by cooperative drinking and urination of the fluid outside the nest. As the ants mostly tap phloem sap from their host plants via their trophobiotic mealybugs and do neither protect their feeding sites nor attack potential living prey they have to be regarded as parasites of their host plants.

Matile-Ferrero, D., Étienne, J. & Tiego, G. 2000. [The introduction of two important pests for French Guiana: *Maconellicoccus hirsutus* and *Paracoccus marginatus* (Hem., Coccoidea, Pseudococcidae). (In French). Bulletin de la Société Entomologique de France 105(5): 485-486. [MatileEtTi2000]

Notes: [Original title: Introduction de deux ravageurs d'importance pour la Guyane française: *Maconellicoccus hirsutus* et *Paracoccus marginatus* (Hem., Coccoidea, Pseudococcidae).] Origins, distributions and hosts are given for these two pests.

Maw, H.E.L., Foottit, R.G., Hamilton, K.G.A. & Scudder, G.G.E. 2000. In: , Checklist of the Hemiptera of Canada and Alaska. NRC Research Press, Ottawa, Ontario, Canada. 220 pp. [MawFoHa2000]

Notes: 93 species from 11 families of scales reviewed: Margodidae (Margarodidae), Ortheziidae, Aclerdidae, Asterolecaniidae, Coccidae, Cryptococcidae, Dactylopiidae, Diaspididae, Eriococcidae, Kermesidae and Pseudococcidae. Distributions and common names in are given English and French.

McGee, G.G. 2000. The contribution of beech bark disease-induced mortality to coarse woody debris loads in northern hardwood stands of Adirondack Park, New York, U.S.A. Canadian Journal of Forest Research 30(9): 1453-1462. [McGee2000]

Notes: The objective of this study was to adjust previously published estimates of coarse woody debris (CWD) volume and basal areas in northern hardwood forests to account for elevated CWD inputs due to beech bark disease (a disease complex of the scale insect, *Cryptococcus fagisuga* Lindinger, and a fungus, *Nectria* spp., on American beech, *Fagus grandifolia* Ehrh.). Ratios of snags/live tree densities and downed CWD volume/live tree basal area were compared between beech and the codominant, shade-tolerant sugar maple (*Acer saccharum* Marsh.). The differences between the beech and the sugar maple ratios were used to define the elevated mortality from beech bark disease.

McKenzie, E.H.C., Buchanan, P.K. & Johnston, P.R. 2000. Checklist of fungi on *Nothofagus* species in New Zealand. New Zealand Journal of Botany 38: 635-720. [McKenzBuJo2000]

Notes: An annotated list is provided of 906 taxa of fungi (including oomycetes and myxomycetes) which have been recorded in New Zealand in close association with the five endemic taxa of *Nothofagus* (southern beech), as ectomycorrhizal mycobionts, pathogens, or saprobes causing decay of wood and leaves. *Nothofagus* forests are an important conservation resource, and a vast storehouse for New Zealand fungi; approximately 35% of the known New Zealand agaric mycota are associated with *Nothofagus*, and 50% of the known polypore species. Sooty mould fungi, growing on honeydew secreted by scale insects, produce conspicuous black growth. Species mentioned as associated with the fungi include *Coelostomidia*, *Crystallotesta fagi* and *Ultracoelostoma* spp.

Mendel, Z., Gross, S., Steinberg, S., Cohen, M. & Blumberg, D. 2001 (1999). Trials for the control of the citrus mealybug in citrus orchards by augmentative release of two encyrtid parasitoids. Entomologica 33(1999): 251-265. [MendelGrSt2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Since the 1980s, the citrus mealybug *Planococcus citri* (Risso) has become a key pest in Israel, owing to intensive planting of highly susceptible varieties, the introduction of Insect Growth Regulators (which adversely affect coccinellids) and the development of resistance to chlorpyrifos. Management of the mealybug populations in citrus orchards by augmentative releases of parasitoids was investigated between 1993 and 1996 in a series of tests involving the release of 5,000-10,000 *Leptomastix dactylopis* (Howard) (Encyrtidae) per hectare. Results showed no significant effect on the density of the mealybug on the fruits. In general, the establishment of *L. dactylopis* was poor and population levels were inferior to those of the naturally occurring *Anagyrus pseudococci* (Girault) (Encyrtidae). In 1996-1997, augmentative early-spring releases of *A. pseudococci* at the rates of 10,000-50,000

individuals per hectare markedly increased the population density of *A. pseudococci* during April and June but had no significant effect on either the mealybug infestation or on fruit damage caused by the pest and its fruit moth associates.

Mestre Novoa, N., Hamon, A.B., Baró Oveido, I. & Reyes Hernandez, M. 2001. [New records of Coccoidea (Homoptera: Sternorrhyncha) for Cuba.] Nuevos registros de Coccoidea (Homoptera: Sternorrhyncha) para Cuba. (In Spanish; Summary In English). *Insecta Mundi* 15(1): 59-61. [MestreHaBa2001]

Notes: *Eriococcus dubius*, *Parasaissetia nigra* and *Saissetia nigra* are recorded for the first time in Cuba. Geographical distributions, collection site, host plants and comments are given.

Meyer, J.R., Nalepa, C.A. & Devorshak, C. 2001. A new species of anicetus (Hymenoptera: Encyrtidae) parasitizing terrapin scale, *Mesolecanium nigrofasciatum* (Hemiptera : Coccidae). *Florida Entomologist* 84(4): 686-690. [MeyerNaDe2001]

Notes: *Anicetus carolinensis* Meyer (Hymenoptera: Encyrtidae) is proposed as the name of a new species found parasitizing terrapin scale, *Mesolecanium nigrofasciatum* (Pergande) (Hemiptera: Coccidae), in North Carolina. Both sexes are described and illustrated together with notes on the life history, host range, and reproductive behavior of the species.

Miller, D.R. 2001 (1999). Identification of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Sternorrhyncha: Pseudococcidae). *Insecta Mundi* 13(3/4): 189-202. [Miller2001]

Notes: [Publication distributed and postmarked 2001; date printed on issue is 1999.] The pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green), has spread rapidly in the tropical and subtropical areas of the New World especially throughout the Caribbean Island, and has recently been discovered in California, Mexico, and Belize. All instars of the pink hibiscus mealybug are described and illustrated to facilitate discovery of infestations. Comparisons with other common pest species are provided for most of the 8 instars, and a table is included that distinguishes the pink hibiscus mealybug from other pest species in the field.

Miller, D.R. & Miller, G.L. 2002. Redescription of *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Coccoidea: Pseudococcidae), including descriptions of the immature stages and adult male. *Proceedings of the Entomological Society of Washington* 104(1): 1-23. [MillerMi2002]

Notes: *Paracoccus marginatus* Williams and Granara de Willink, commonly known as the papaya mealybug was first discovered in the Caribbean in 1994 and was collected in Florida in 1998. To facilitate implementation of control measures we have prepared descriptions, illustrations, and keys for all stages of this species including first instar, second-instar male and female, third-instar male (prepupa) and female, fourth-instar male (pupa) and female (adult), and fifth-instar male (adult). Comparisons are given between *P. marginatus* and other species of *Paracoccus* as well as other commonly encountered mealybug species in Florida and the Caribbean.

Miller, D.R., Ben-Dov, Y. & Gibson, G.A.P. 2001 (1999). Scalenet: a searchable information system on scale insects. *Entomologica* 33(1999): 37-46. [MillerBeGi2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Systematic information on the scale insects of the world is currently being compiled and synthesized in a database system called BASIS. The information is organized by scale insect family and is searchable at a site on the World Wide Web called ScaleNet (<http://www.sel.barc.usda.gov/scalenet/scalenet.htm>). The site provides general information on scale insects, including sections on economic importance, life histories, distribution and ecology, classification and biographies. A query system provides information on valid names and provides a complete systematic catalogue for any valid genus or species. For a particular taxon, queries will give the following information: all hosts of a scale, distribution of a scale, references for a scale, a checklist of all valid species in a family or genus, biological notes and remarks for a scale. It also will give the scales that occur on a particular host, all systematic references on scales that were published between two dates, all references published by an author, all references with any of five selected words in a title or annotations, a list of all scales described by a particular author, all scales from a particular zoogeographic region, country or country subunit, and the scientific name of any common name of a scale.

Miller, D.R., Williams, D.J. & Hamon, A.B. 2001 (1999). Notes on a new mealybug (Hemiptera: Coccoidea: Pseudococcidae) pest in Florida and the Caribbean: the papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink. *Insecta Mundi* 13(3/4): 179-181. [MillerWiHa2001]

Notes: [Publication distributed and postmarked 2001; date printed on issue is 1999.] *Paracoccus marginatus* Williams and Granara de Willink, here called the papaya mealybug, was first detected in the United States in Hollywood, Florida in 1998. By the end of 1998 it was found in four localities in the state and has since spread to nine localities in five counties. This mealybug appears to have moved through the Caribbean area since its 1994 detection in the Dominican Republic. The pest is reported to cause serious damage to tropical fruit, especially papaya, and has been detected most frequently, in Florida, on hibiscus. It is now known from Antigua, Belize, the British Virgin Islands, Costa Rica, Guatemala, Mexico, Nevis, Puerto Rico, St. Barthelemy, St. Kitts, St. Martin, and the US Virgin Islands. The species is believed to be native to Mexico and/or Central America. Hosts are listed.

Mishra, Y.D., Sushil, S.N., Bhattacharya, A., Kumar, S. & Mallick, A. 2000. Genetic variations in some productivity linked traits of female lac insects, *Kerria* spp. (Homoptera: Tachardiidae). *Journal of Entomological Research*. New Delhi 24(2): 121-124. [MishraSuBh2000]

Notes: Lac insect stocks collected from different localities and host plant species were studied for their performance in respect of five productivity linked female traits, viz., life period, fecundity, dry cell weight, diameter of the cell, and rate of sticklac production during the rainy crop season on *Flemingia macrophylla* by determining intertrait correlation for the former four traits as well as estimating genetic variance and heritability (in a broad sense) for all the five traits. A highly significant positive correlation between the cell weight and life period, cell weight and diameter of cell, fecundity and diameter of cell, as well as life period and diameter of cell was established. On the other hand, non significant correlation of fecundity with cell weight and life period was recorded.

Mishra, Y.D., Sushil, S.N., Chakrabarty, P.K., Bhattacharya, A. & Kumar, S. 2000. Estimating stick lac productivity of lac on ber, *Zizyphus mauritiana* Lamk. through regression model. *Journal of Entomological Research*. New Delhi 24(4): 343-348. [MishraSuCh2000]

Notes: For developing multiple regression model for estimating stick lac productivity of lac insect stocks, a multiple regression analysis was conducted by taking density of settlement, percent initial mortality, sex ratio, female population, mean live cell weight, resin per female, dry cell weight, density at crop maturity, and life period as independent variables; and sticklac productivity as dependent variable. Out of 51 values of correlation coefficient obtained, 24 revealed highly significant positive and 3 significant negative values while the remaining were non-significant. The multivariate equation derived from only four independent variables i.e. from resin per female, dry cell weight, density at crop maturity, and life period was the most efficient and convenient model for estimating lac productivity to the tune of 97.76% (R^2) accuracy.

Miyanoshita, A. & Tatsuki, S. 2001. Role of sex pheromones in reproductive isolation between two host races in *Aspidiotus cryptomeriae* Kuwana (Homoptera : Diaspididae). *Applied Entomology and Zoology*. Tokyo 36(no. 2): 199-202. [MiyanTa2001]

Notes: The reproductive isolation between two host races of *Aspidiotus cryptomeriae* was examined by comparing intra- and inter-racial responses of males to live virgin females and to sex pheromones in the laboratory. No inter-racial copulation of males to live females was observed for either sex combination. These results indicated that ethological isolation was present between the races. We showed by using a crude extracts test that both host races have female sex pheromones. Although an inter-racial response of males to female extracts was observed it was much weaker than the intra-racial responses, suggesting that the sex pheromone system plays an important role in reproductive isolation between the two races. These results support the hypothesis that each host race is a distinct species.

Mkrtychian, L.P. & Sarkissov, R.N. 2001 (1999). Some characteristics of the development of the sex organs in Margarodid males. *Entomologica* 33(1999): 167-168. [MkrtychSa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. A comparative study of the male sex organs of three

subfamilies of the Margarodidae (namely Margarodinae, Monophlebinae and Coelostomidiinae) has shown that some morpho-functional rearrangements occur in their ontogenesis during the pre-imaginal period. These changes lead to a reduction of the testes and the formation of an evolutionarily new structure, a spermsac filled with semen bundles. During this general process of structural transformation, two types of spermsac construction can be distinguished, which allows the males of these subfamilies to be divided into two groups: 1. A group which has a spermsac with an ejaculatory duct which penetrates the more or less long, sclerotised penis (e.g., as in species of *Porphyrophora*, *Steingelia* and *Matsucoccus*) 2. A second group where the ejaculatory duct opens into the spermsac and the penis is very short and straight. In this group, the duct is turned out during copulation and then lowered into it - as in species of *Icerya*, *Drosicha* and *Neomargarodes*. The inner position of the ducts in the male sex organs of some scale insects (e.g., male *Neomargarodes* which retain rudiments of the testes) suggests that this is the primitive condition and that the external position of the ejaculatory duct is secondary. In addition, further study of the Margarodidae has shown that the duct has evolved differently in different groups. Thus, in the first group, the penis tube with the ejaculatory duct within it has developed progressively, while in the second group, in which the penis tube is short, the development of the ejaculatory duct seems to have occurred within the spermsac.

Mohammad, Z.K., Ghabbour, M.W. & Tawfik, M.H. 2001 (1999). Population dynamics of *Aonidiella orientalis* (Newstead) (Coccoidea: Diaspididae) and its parasitoid *Habrolepis aspidioti* Compere & Annecke (Hymenoptera: Encyrtidae). *Entomologica* 33(1999): 413-418. [MohammGhTa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] An experiment was carried out at Giza governorate, Egypt, between Aug. 1995 and Aug. 1997 to study the fluctuation and seasonal abundance of *Aonidiella orientalis* and its parasitoid *Habrolepis aspidioti* on *Ficus nitida* trees. A brief description of the parasitoid is given. The populations of *A. orientalis* in both years showed three distinct peaks during the summer, whilst the parasitoid probably had four. The effect of such climatic factors as temperature, relative humidity, photoperiod, dew point and wind velocity were also studied and the size of the populations of both the scale and the parasitoid appeared to be correlated with many of them.

Momen, F.M. 2001. Effects of diet on the biology and life tables of the predacious mite *Agistemus exsertus* (Acari: Stigmaeidae). *Acta Phytopathologica et Entomologica Hungarica* 36(1-2): 173-178. [Momen2001]

Notes: The biology of *A. exsertus* was studied using two different insect eggs, *Ephestia kuehniella* and *Parlatoria zizyphus* [*P. ziziphil*] as the food source. The development was faster and reproduction was higher when *A. exsertus* fed on eggs of *E. kuehniella*. A total of 97.78 and 75.27 eggs per female were obtained when eggs of *E. kuehniella* and *P. zizyphus* were provided, respectively. A diet of *E. kuehniella* (eggs) provided the greatest female longevity and mean total fecundity which resulted in higher net reproductive rate (R_0) value (61.25), intrinsic rate of natural increase (r_m = 0.196) and finite rate of increase (r_m = 1.22) per day for *A. exsertus*. A diet of *P. zizyphus* (eggs) resulted in close values of T = 21.70; r_m = 174; erm = 1.19. The sex ratio of the progeny was strongly female biased (female/total = 0.72 and 0.66) when both eggs of *E. kuehniella* and *P. zizyphus* were provided.

Mondal, S. & Ghosh, A.B. 2000. Morphology of different instars of pink sugarcane mealybug, *Saccharicoccus sacchari* (Cockerell) (Homoptera, Pseudococcidae). *Journal of Interacademica* 4(1): 113-130. [MondalGh2000]

Notes: Descriptions with illustrations and a key to the identification of different instars of the pink sugarcane mealybug, *Saccharicoccus sacchari* (Cockerell) are given. The trilocular, quadrilocular, clusters of quinquelocular and multilocular disc pores secrete waxy dusts, particulate wax, waxy thread-like caudal projections and globular waxy particles, respectively. Oral collar tubular ducts produce waxy cottony fibres and the glands of anal ring secrete waxy tubes.

Mori, N., Pellizzari, G. & Tosi, L. 2001. [First record of the wax scale *Ceroplastes ceriferus* (Fabricius) (Hemiptera, Coccoidea) in Italy.] Già acclimatato in Italia il coccide *Ceroplastes ceriferus* (Fabricius) (Hemiptera, Coccoidea). *Informatore Fitopatologico* 10: 41-43. [MoriPeTo2001]

Notes: This species was recorded in the Verona district on several ornamental plants. It is the first record of this species in Europe. *C. ceriferus* is probably native to Asia and is now considered nearly cosmopolitan. It is a polyphagous species, has one generation/year and overwinters as an adult female.

Muralidharan, C.M. & Badaya, S.N. 2000. Mealy bug (*Maconellicoccus hirsutus*) (Pseudococcidae: Hemiptera) out break on herbaceum cotton (*Gossypium herbaceum*) in Wagad cotton belt of Kachchh. Indian Journal of Agricultural Sciences 70(10): 705-706. [MuraliBa2000]

Notes: N/A

Myartseva, S.N. 2001. A new species of parasitoid wasp of the genus *Encarsia* (Hymenoptera: Aphelinidae) from Tamaulipas, Mexico. (In English; Summary In Spanish). Acta Zoologica Mexicana Nueva Serie 82: 13-18. [Myarts2001]

Notes: *Encarsia pinella* new sp. was reared from the diaspine scale *Melanaspis* sp. on *Pinus* spp.

Myartseva, S.N. & Ruiz-Cancino, E. 2000. Annotated checklist of the Aphelinidae (Hymenoptera: Chalcidoidea) of México. (In English; Summary In Spanish). Folia Entomologica Mexicana 109: 7-33. [MyartsRu2000]

Notes: Species listed as hosts include *Acutaspis agavis*, *Antonina graminis*, *Aonidiella aurantii*, *A. citrina*, *Aspidiotus destructor*, *A. nerii*, *Ceroptastes* sp., *Chrysomphalus aonidum*, *C. dictyospermi*, *Clavaspis ?subsimalis*, *Coccus hesperidum*, *C. viridis*, *Diaspis echinocacti*, *D. simmondsiae*, *Hemiberlesia rapax*, *Lecanodiaspis rufescens*, *Lepidosaphes beckii*, *L. gloverii*, *Parlatoria pergandii*, *Pinnaspis strachani*, *Pseudococcus agavis*, *Pseudoparlatoria* sp., *Quadrasiidotus perniciosus*, *Saissetia oleae*, *Toumeyella numismaticum* and *Unaspis citri*.

Nakata, T., Sugiura, N. & Takagi, M. 2000. Host searching efficiency of *Aphytis yanonensis* and *Coccobius fulvus* (Hymenoptera: Aphelinidae), introduced parasitoids of *Unaspis yanonensis* (Homoptera: Diaspididae). Science Bulletin of the Faculty of Agriculture, Kyushu University 55(1): 21-25. [NakataSuTa2000]

Notes: Host searching efficiency of female adults of *Aphytis yanonensis* and *Coccobius fulvus*, introduced parasitoids of *Unaspis yanonensis*, was investigated in the laboratory, using mandarin orange (*Citrus unshiu*) leaf patches (4X4 cm) with host density of 1, 2, 4 and 8 per patch. We recorded host searching and oviposition behavior of individual female parasitoids until they left the patch. In the higher host density *A. yanonensis* females attacked more hosts than *A. fulvus* females when comparing the number of host attacked for 30 or 60 minutes after the patch entrance. This was because of the longer oviposition time per host attack in *C. fulvus* than in *A. yanonensis*. However, patch resident time of *C. fulvus* was longer than that of *A. yanonensis*, and no significant difference was detected in the number of hosts attacked and parasitized when compared to the per patch visit. It was suggested that the host searching efficiency per unit time was higher in *A. yanonensis* but that the host searching efficiency per patch visit was not different because *C. fulvus* stayed on the patch longer.

Narendran, T.C., Bijankumar, D. & Das, B. 2000. A new species of the rare genus *Austroterobia* Girault (Hymenoptera: Pteromalidae: Austroterobiinae) from West Bengal, India. Zoos' Print Journal 15(9): 319-321. [NarendBiDa2000]

Notes: A new species of Pteromalidae, *Austroterobia maldica* sp. nov., parasitising an undetermined species of *Icerya* (Coccoidea) associated with mango in West Bengal, India, is described and its affinities are discussed.

Neser, O.C. & Prinsloo, G.L. 2001. *Aphytis chionaspis* (Hymenoptera : Aphelinidae), a parasitoid introduced to South Africa from Thailand for the control of mango scale, *Aulacaspis tubercularis* (Hemiptera : Diaspididae). African Entomology 9(2): 199-201. [NeserPr2001]

Notes: N/A

Neuenschwander, P. 2001. Biological control of the cassava mealybug in Africa: A review. Biological Control 21(3): 214-229. [Neuens2001]

Notes: Among several natural enemies introduced to combat the cassava mealybug, *Phenacoccus manihoti* (Homoptera: Pseudococcidae), the neotropical parasitoid *Apoanagyrus* (Epidinocarsis) *lopezi* (Hymenoptera: Encyrtidae) was the most successful. It established in 26 African countries, causing a satisfactory reduction in the population density of *P. manihoti* in most farmers' fields. Four conclusions concerning the possible application of the research results to other biological control projects are discussed. (1) Foreign exploration was intensive and should be maintained at this level in other projects, if necessary at the cost of other activities. (2) In the controversy about the

amount of research results needed before first releases are made, an understanding of the proper role of quarantine is essential. Whereas quarantine (preferably outside the continent) guarantees nonnoxiousness of natural enemies, only research in the experimental release sites can determine whether a given natural enemy will be efficient. It was confirmed that the released exotic insects did not affect the diversity of the indigenous fauna. Modalities used in this project for the execution of releases, i.e., always on request by and in collaboration with national programs, are recommended for adoption in future projects. (3) Laboratory and field studies established the scientific basis for quantifying the impact of the pest insect and its control by *A. lopezi*. This was expressed as reduction in pest population levels, yield loss and gain in revenue. Behavior of adult females in searching and choosing hosts was identified as a better predictor of efficiency of a species in the field than life table studies under controlled temperatures. (4) It is concluded that biological control is the basis for integrated pest management. Other interventions, such as cultural methods or the use of resistant varieties, need to be in harmony with biological control because the impact of natural enemies cannot usually be manipulated by the farmer. To achieve sustainability, the aim is to optimize tritrophic interactions among the plant, the phytophagous pest organisms, and their natural enemies, rather than to maximize the effect of a single intervention.

Nickel, O., Chagas, C.M. & Vasconcelos, A.P.A. 2000. [Association of pineapple mealybug wilt with closterovirus-like particles and dsRNA in Bahia, Brazil.] (In Portuguese; Summary In English). *Fitopatologia Brasileira* 25(2): 200-202. [NickelChVa2000]

Notes: Leaf and root extracts of pineapple *Ananas comosus* 'Smooth Cayenne' with and without symptoms of pineapple mealybug wilt (PMW) examined under the electron microscope contained closterovirus-like particles ranging in size from 1,000 to 1,500 X 13 nm, with a modal length of 1,200 nm. A few particles of approximately 2,250 nm in length were also observed. The mealybug *Dysmicoccus brevipes* was found colonizing pineapple. dsRNA in the range of 0.4 to 17.4 Kb was found in leaves of PMW-diseased pineapple 'Smooth Cayenne', wild bromelias (*Pseudananas sagenarius* and *A. bracteatus*) and a diseased hybrid of *A. comosus* ('Perolera' X 'Smooth Cayenne') submitted to analysis by PAGE. These molecules were not found in seedlings. In SDS-PAGE of virus preparations only one major protein was detected, probably the coat protein, with an approximately Mr of 25 kDa. The nature of the relationship between the closterovirus-like particles and PMW is presently under study.

Novartis Agribusiness Chile SA. 2000. (In Spanish). In: , [Integrated pest management programme. Pome fruit orchards.] Programa manejo integrado de plagas. . . 31 pp. [NAC2000]

Notes: Information is presented from an integrated pest management programme in 11 pome fruit orchards in Chile during 1999-2000. Control was based on monitoring of 7 major arthropod pests, including (*Quadrasipidiotus perniciosus* /*Diaspidiotus perniciosus*), and some diseases, and their natural enemies. An evaluation of the integrated control programme is given and comments from orchard administrators are included.

Nucifora, S. & Watson, G.W. 2001 (1999). Armoured scale insects (Hemiptera: Coccoidea: Diaspididae) new to Sicily: records and observations. *Entomologica* 33(1999): 207-211. [NucifoWa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The central location of Sicily in the Mediterranean basin makes studies of its fauna particularly interesting. Recent collections from the scrub vegetation on the South-East coast of Sicily and the slopes of Mount Etna have produced four new records of Diaspididae for Sicily: *Aonidia ?mediterranea* (Lindigner), *Ferreroaspis hungarica* (Vinis), *Mercetaspis isis* (Hall) and *Chionaspis etrusca* Leonardi. The presence of the first three species suggests old faunistic links with other regions, mainly eastern Mediterranean. Our findings are presented here in the hope of stimulating more such research.

Obra, G.P.B. & Rejesus, B.M. 2000. Biological studies of *Aphytis* sp. nr. *chrysomphali* (Hymenoptera: Aphelinidae). *Philippine Entomologist* 14(2): 137-147. [ObraRe2000]

Notes: The parasitoid, *Aphytis* sp. nr. *chrysomphali* was collected from coconut scale, California red scale and Florida red scale attacking citrus in Aug 1989 from Villaverde, Nueva Viscaya [Philippines]. The biology of the parasitoid on coconut scale, *Aspidiotus destructor* Signoret reared on squash was studied. The total developmental period of the uniparental (thelytokous) parasitoid from egg deposition to adult emergence ranges from 13-15 days with a mean of

14.18 plus or minus 0.90. The longevity of adult *Aphytis* sp. nr. *chrysomphali* fed with honey ranges from 4-22 days with a mean of 8.45 plus or minus 4.12 days whereas starved adults lived only to a maximum of 33 hours. The total fecundity ranges from 9-24 eggs with a mean of 16.44 eggs.

Öncüer, C., Uygun, N., Erkiliç, L.B. & Karsavuran, Y. 2001 (1999). An annotated list of scale insects (Hemiptera: Coccoidea) from Turkey. Entomologica 33(1999): 231. [OncuerUyEr2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. A list of the 171 species of Coccoidea from Turkey, belonging to 10 families, is presented. This list is based on the authors' collection data and on bibliographical sources. The most numerous families are Diaspididae (92 species), Coccidae (31 species) and Pseudococcidae (18 species). The remaining families have between 1 and 7 species each. Among the 171 species are 15 species which are considered to be endemic and their distribution was discussed. In our orchard ecosystems, 11 species are of sufficient importance to require control measures, while in our citrus pest management program, 4 species have pest status. In addition to the cultivated plants, non-cultivated plant have many scale insect species because of the zoogeographical situation of Turkey, lying as it does between the Mediterranean, the Irano-Turanian and Euro-Siberian subregions of Palaearctic. This list is unlikely to be complete and further studies are needed.

Oetting, R.D. 2001. Mexican mealybug -- or is it? Greenhouse Business 7(9): 27-28. [Oettin2001]

Notes: *Phenacoccus gossypii*, *Planococcus citri*, *Pseudococcus longispinus*, *P. comstocki*, *P. maritimus* and *Rhizoecus falcifer* are discussed.

Ozaki, K., Takashima, S. & Suko, O. 2000. Ant predation suppresses populations of the scale insect *Aulacaspis marina* in natural mangrove forests. Biotropica 32(4): 764-768. [OzakiTaSu2000]

Notes: Previous studies on scale insect-ant interactions have focussed on the mutual relationships between scale insects that produce exudates and attendant ants. These studies may have over-emphasized the prevalence of plus/plus interspecific activity and underestimated the negative effects of ants as predators. The results in this report, however, emphasize that understanding complex scale insect-ant interactions will require a broader survey of the different kinds of interactions between scale insects and ants.

Özgökçe, M.S., Yasar, B. & Karaca, I. 2001 (1999). Life tables of *Lepidosaphes ulmi* (L.) and *Palaeolecanium bituberculatum* (Targioni Tozzetti) (Hemiptera: Coccoidea) on apple trees in Van Province, Turkey. Entomologica 33(1999): 317-322. [OzgokcYaKa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Apples are the most important cultivated crop in Van Province in Eastern Anatolia Region, Turkey, where *Lepidosaphes ulmi* (L.) and *Palaeolecanium bituberculatum* (Targioni Tozzetti) (Hemiptera: Coccoidea) are among the most economically important pest species. Life-table data were collected in the field for these two species in two different apple orchards. The development time for each stage was recorded once a month in the winter and every fortnight during the spring, summer and autumn. In each orchard, both shoots and leaves of five randomly selected trees were sampled and each stage of the two scale species was counted. The life-table data were analyzed with regard to the age of the insects and the season, and it was found that *L. ulmi* and *P. bituberculatum* had one generation a year. Of several mortality factors, parasitisation was the most important (25.8% for *L. ulmi* and 23.8% for *P. bituberculatum*).

Panis, A. & Pinet, C. 2001 (1999). A discussion of some ecological factors affecting *Coccidencyrtus malloii* Blanchard (Hymenoptera, Encyrtidae) as a parasitoid of diaspidid scales under glass in France. Entomologica 33(1999): 419-422. [PanisPi2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The encyrtid parasitoid *Coccidencyrtus malloii* Blanchard has been recorded in orchid glasshouses of south-eastern France where its diaspidid host, *Diaspis boisduvalii* Signoret (Hemiptera, Diaspididae) is sometimes a pest of ornamentals. In order to study its biology and potential as a biological

control agent, it was cultured on a bromeliad and released into several hot temperate commercial houses. It was found to have a very restricted distribution which appeared to be determined by deep shade and very high humidity.

Panis, A. & Pinet, C. 2001a (1999). A study of two *Plagiomerus* species (Hymenoptera: Encyrtidae) parasitising diaspidid scales (Coccoidea) in glasshouses in France. *Entomologica* 33: 423-427. [PanisPi2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Plagiomerus diaspidis* Crawford was imported from Tenerife (Canary Islands, Spain) and released experimentally as a biological control agent against *Diaspis echinocacti* (Bouché) (Hemiptera, Diaspididae) within a cactus glasshouse in southeastern France but it failed to provide control, apparently due to very weak powers of dispersal. A second undescribed *Plagiomerus* was found in a wet tropical greenhouse in the same region of France and was thought to be a potential biocontrol agent of Diaspididae. It was found to parasitise the three *Diaspis* species (*D. boisduvalii* Signoret, *D. cocois* (Lichtenstein) and *D. bromeliae* (Kerner)) present in the greenhouse, although it failed to control them. Both parasitoid species reproduced by thelytokous parthenogenesis.

Parkes, G.T. & Walter, G.H. 2001. Mating behaviour and alternative oviposition sites for male eggs in the heteronomous hyperparasitoid *Coccophagus gurneyi* Compere (Hymenoptera: Aphelinidae). *Australian Journal of Entomology* 40(1): 74-78. [ParkesWa2001]

Notes: The aphelinid parasitoid *Coccophagus gurneyi* Compere has unusual sex-related host relationships. Females are diploid and develop internally within mealybugs *Pseudococcus calceolariae* (Maskell). Males, in contrast, are haploid and hyperparasitic, developing on primary parasitoid larvae within the mealybugs. Furthermore, males have been claimed to be capable of either internal or external development, depending on the precise site of deposition of the haploid egg. This diversity of developmental pathways could indicate the existence of a sibling-species complex. We therefore quantified the mating and ovipositional behaviour of *C. gurneyi*, for comparison with that of an undescribed sibling species. We also checked whether the females deposit male eggs in alternative sites. The pattern of mating was found to be typical of mating behaviour in *Coccophagus* spp. and was consistent among all mating pairs, suggesting that the colony comprised one species. Further, the mating behaviour was significantly different from that of the undescribed sibling species. The site of male egg deposition varied and is apparently dictated by two factors; whether the mealybug is parasitised and, if so, the size of the parasitoid it contains. If the mealybugs were unparasitised or if the parasitoids within the mealybugs were small (< 0.53 mm), male eggs were deposited within the mealybug haemocoel. If the parasitoids were large (> 1.05 mm), male eggs were deposited within the parasitoids. These results support the claim of alternate host relationships and developmental pathways within males of *C. gurneyi*.

Pathak, S.K. & Yadav, D.N. 2000. Biology of *Eublemma scitula* Ramb. (Lepidoptera: Noctuidae), a predator of brown scale, *Saissetia coffeae* Wlk. (Homoptera: Coccoidea) infesting pointed gourd, *Trichosanthes dioica* Roxb. *Journal of Entomological Research*. New Delhi 24(2): 167-175. [PathakYa2000]

Notes: The biology of *Eublemma scitula* Ramb, an important predator of scale insect, *Saissetia coffeae* Wlk., a serious pest of pointed gourd was studied at Anand campus of Gujarat Agricultural University during 1985 and 1986. Eggs of the predator were laid singly and hatched in 4-6 days. All the larval stages were predatory on scale insect and consumed on an average 18.05 mature female scales, the maximum being 22 during the larval period.

Pedata, P.A. & Garonna, A.P. 2001. Coexistence of two effective parasitoids of the white peach scale *Pseudaulacaspis pentagona* (Hemiptera : Diaspididae): the role of host stage and temperature. *Bulletin of Entomological Research* 91(1): 53-59. [PedataGa2001]

Notes: *Encarsia berlesei* (Howard) and *Pteroptrix orientalis* (Silvestri) are endoparasitoids of *Pseudaulacaspis pentagona* (Targioni Tozzetti), that are sympatric in Campania (Italy). The influence of host stages on several components of *E. berlesei* fitness and the effect of mating status on the production of *Pteroptrix orientalis* progeny were evaluated at 25 degrees C. Parasitization of earlier host stages resulted in an increase in the development time and a decrease in progeny number of *E. berlesei*. Adult parasitoids were largest when young female stages were parasitized. Pupal mortality did not differ among host stages. Mated female *P. orientalis* produced a greater number of progeny and proportionally fewer sons (13.6% of the total progeny) than did virgin females (21.7%). The reproductive potential of both parasitoids was also evaluated at four regimes of constant temperature (20, 24, 26 and 30 degreesC). *Encarsia*

berlesei attained r(m) values nearly double those of *P. orientalis* at 20, 24 and 26 degreesC, while at 30 degreesC the two parasitoids achieved the same r(m) value, since at this temperature *E. berlesei* suffered a high pupal mortality. Sex ratio of *P. orientalis*, expressed as proportion of males, varied significantly between 20 and 24 degreesC only.

Pellizzari-Scaltriti, G. & Fontana, P. 2001 (1999). A study on the life history of *Lecanopsis clodiensis* (Pellizzari) n. comb. Hemiptera: Coccoidea: Coccidae). Entomologica 33(1999): 323-332. [PellizFo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The biology of *Lecanopsis clodiensis* (Pellizzari) has been studied in Italy, where the species is widespread and lives on Gramineae. The species has one generation/year. Adult emergence takes places in April-May, depending on the meteorological conditions. After mating, the females lay eggs and the crawlers hatch within a month and disperse to the root-crowns of the host plant (a Gramineae) and settle under the leaf-sheath in very protected positions. The 3rd-instar female nymphs and 2nd-instar male nymphs overwinter. All nymphal stages are covered by a glassy wax test. Some aspects of its life history have been investigated in their natural environments (a sandy beach and a meadow) and in the laboratory, particularly its reproductive behaviour, the behaviour of both fertilised and virgin females, its mating behaviour and the dispersal of the adult female. Other observations on the remarkable biology of this species are reported.

Persad, A. & Khan, A. 2000. The effect of five insecticides on *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae) and its natural enemies *Anagyrus kamali* (Hymenoptera: Encyrtidae), and *Cryptolaemus montrouzieri* and *Scymnus coccivora* (Coleoptera: Coccinellidae). International Pest Control 42(5): 170-173. [PersadKh2000]

Notes: Five commonly used insecticides, lambda-cyhalothrin, pirimiphos-methyl, triazophos, fipronil and decamethrin [deltamethrin] were evaluated in the laboratory and under semi-field conditions for comparative effects on the pink mealybug *Maconellicoccus hirsutus* and its exotic natural enemy complex. Adult *M. hirsutus* were more tolerant to all insecticides tested while the 1st instar stage was least tolerant. Chemical control was best achieved using either pirimiphos-methyl or triazophos on the 1st instar stage. *Anagyrus kamali* was most susceptible to all insecticides tested. Fipronil provided the highest selectivity ratios when used together with *Cryptolaemus montrouzieri* and was also least persistent (LT50 value of 7 days) for *A. kamali* in the field.

Pickel, C., Bentley, W., Rice, R.E., Brazzle, J., Hasey, J. & Day, K. 2000. Pests of peach. UC Pest Management Guidelines [PickelBeRi2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.peach.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of peach in the U.S., including *Quadrapsidiotus perniciosus*.

Pickel, C., Olson, W.H., Zalom, F. & Reil, W. 2000 (1998). Pests of prune. UC Pest Management Guidelines [PickelOlZa2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.prune.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of prune in the U.S., including *Parthenolecanium corni*, *Epidiaspis leperii* and *Quadrapsidiotus perniciosus*.

Podsiadlo, E. 2000. Morphology of the second instar larva of *Quadrapsidiotus zonatus* (Hemiptera: Coccinea: Diaspididae). Polskie Pismo Entomologiczne 69: 397-404. [Podsia2000]

Notes: Second instar larvae of *Q. zonatus* (Frauenfeld) are collected from *Quercus robur*, described and illustrated. Sexual differences are discussed.

Podsiadlo, E. 2001 (1999). Sexual dimorphism in the first- and second-nymphal instars of *Quadrapsidiotus zonatus* (Frauenfeld) (Hemiptera: Coccinea: Diaspididae). Entomologica 33(1999): 139-140. [Podsia2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Morphological characters separating male and female 1st- and 2nd-instar nymphs of *Quadrapsidiotus zonatus* are discussed. In the 1st instar, male nymphs possess a campaniform sensillum on each tarsus and dorsal submedian setae on the 1st abdominal segment; these characters are absent on the female. There

is also a slight difference in the body shape. In the 2nd-instar nymphs, the differences are greater. In the male nymph, the number of glandular ducts is much greater than in the female and there is a pair of setae present on the 1st abdominal segment and three pairs of ventral submedian setae on the head (absent on the female). There is also a greater difference in body shape than in the 1st-instar nymphs.

Podsiadlo, E. & Lambdin, P.L. 2001. Description of the first instar of *Psoraleococcus verrucosus* Borchsenius (Hemiptera: Coccoidea: Lecanodiaspididae). Polskie Pismo Entomologiczne 70: 3-8. [PodsiaLa2001]

Notes: This is the first description of this immature form. It is one of four species assigned to this genus.

Polaszek, A. & Prinsloo, G.L. 2000. The identity of *Pteroptrix imitatrix* (Fullaway) (Hymenoptera: Aphelinidae). Journal of Hymenoptera Research 9(2): 320-323. [PolaszPr2000]

Notes: Taxonomic notes are provided on two aphelinid wasps, *Pteroptrix imitatrix*, described from Hawaii, and *Pteroptrix albifemur* (host, *Howardia biclavis*), described from Australia. The former is shown to be a synonym of the latter.

Porcelli, F. 2001 (1999). Fine morphology of the antennae of *Diaspis echinocacti* (Bouché) 1833 (Hemiptera: Diaspididae). Entomologica 33(1999): 141-152. [Porcel2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The antennae in the Diaspididae are reduced to minute appendages composed of one antennomere called the "antennal tubercle". Few or no setae can be found on the antennal tubercle, although some small pegs in cuticular invaginations can be seen. In *Diaspis echinocacti*, the single antennal seta arises from two fused sensilla at its base. The chemoreceptive (olfactory) function of these multiporous sensilla was demonstrated using crystal violet and Transmission Electron Microscopy (TEM), while further information was obtained using light microscopy (LM), confocal laser scanning microscopy (CLSM) and Scanning Electron Microscopy (SEM). Some hypotheses on the possible function of these sensilla are discussed: (a) a feedback system to regulate the production of the female pheromone; (b) for detecting a male pheromone (postulated), or (c) for detecting a pheromone (postulated) produced by the crawlers. The possible evolutionary reduction in the number of antennal sensilla by fusion is evaluated. The lowest number of setae is accepted as the derived status for the character.

Porcelli, F. & Garonna, A.P. 2001 (1999). A multi-contributors database for all aspects of the biology and control of the Diaspididae. Entomophaga 33(1999): 47-48. [PorcelGa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The difficulties of studying the Diaspididae from an Agricultural Entomology point of view are recognized by the authors. A multi-contributors database, which includes all aspects of biological control, host-plant relationships, world distribution and taxonomy, is submitted for the attention of researchers engaged in the control of armoured scale insect pests. The database will be available before the end of 1999 by a link on the Scale Insect Forum (<http://193.204.185.103/scaleinfo/scale.htm>).

Raciti, E. & Saraceno, F. 2001. [Rearing of *Aphytis melinus* for biological control of *Aonidiella aurantii*.] Allevamento di *Aphytis melinus* per il controllo biologico di *Aonidiella aurantii*. (In Italian). Informatore Agrario 57(19): 39-40. [RacitiSa2001]

Notes: A study was conducted in Italy to develop a method for rearing of *Aphytis melinus* on its alternative host *Aspidiotus nerii* under laboratory conditions. Butternut gourd is suggested as the best substrate for *A. nerii*. Techniques for handling the substrate are outlined, as well as rearing the mother strain of *A. nerii*, production and collection of parasitoids.

Raciti, E., Barraco, D. & Conti, F. 2001. [Biological control of the citrus mealybug.] Controllo biologico del cotonello degli agrumi. (In Italian). Informatore Agrario 57(19): 49-54. [RacitiBaCo2001]

Notes: A study was conducted as a continuation of investigations initiated in Sicily in 1993 within the project on integrated control of citrus mealybug (*Planococcus citri*) to evaluate parasitism by *Leptomastix dactylopis*, as well as that of indigenous species *Anagyrus pseudococcii* and *Leptomastoidaea* [*Leptomastidea*] *abnormis*. As *Leptomastix*

dactylopii does not survive low temperature, it needs to be reintroduced every year. Experiments were conducted on 3 farms with susceptible Navelina oranges during 1995-97, 1998 and 2000. Data are presented on captures of males with yellow pheromone traps, damage to commercial plantations, and composition of parasitoid populations. Introduced *L. dactylopii* populations were a decisive factor in control of pest populations. The level of parasitism reached 50% (and 70% when considering pupae which did not come out of cocoons). Parasitism by *A. pseudococci* was 60%, while *L. abnormis* was less effective. The presence of hyperparasitoids *Chartocerus kurdjumovi* and *Pachyneuron concolor* is also reported.

Raupp, M.J., Holmes, J.J., Sadof, C., Shrewsbury, P. & Davidson, J.A. 2001. Effects of cover sprays and residual pesticides on scale insects and natural enemies in urban forests. Journal of Arboriculture 27(4): 203-214. [RauppHoSa2001]

Notes: Trees in residential landscapes that received three cover sprays annually for at least four years harbored a greater diversity of scale insect pests and were much more likely to be infested with scales than trees in landscapes treated with cover sprays for shorter periods of time. Oak (*Quercus palustris*) trees in an institutional landscape treated with residual insecticides harbored significantly lower numbers of beneficial arthropods than trees treated with a pesticide that lacked residual activity. The suppressive effect of residual insecticides on natural control was pronounced on the community of parasitic wasps that attack the obscure scale (*Melanaspis obscura*), a common scale insect pest of oak. Other species discussed include *Chionaspis pinifoliae*, *Fiorinia externa*, *Lepidosaphes beckii*, *Parthenolecanium corni* and *Planococcus citri*.

Reddy, D.J. & Aziz, S.A. 2000. Record of *Dicrodiplosis* sp. on sugarcane mealybug. Insect Environment 6(3): 104. [ReddyAz2000]

Notes: The cecidomyiid *Dicrodiplosis* was found preying on *Saccharicoccus sacchari* in Andhra Pradesh, India [date not specified].

Rehman, S.U., Browning, H.W., Nigg, H.N. & Harrison, J.M. 2000. Increases in Florida red scale populations through pesticidal elimination of *Aphytis holoxanthus* Debach in Florida citrus. Biological Control 18(2): 87-93. [RehmanBrNi2000]

Notes: The effect of carbaryl and dicofol on populations of *Chrysomphalus aonidum* and *Aphytis holoxanthus* was studied on *Citrus* in the field in Florida during 1995. Populations of *C. aonidum* increased at the end of August in plots treated with carbaryl and dicofol in comparison with populations in untreated plots. The mean density of reproductive stages increased from July to September in all treatments and declined later in the year. The carbaryl treatment had a significantly higher overall density of n3 plus gravid females, gravid females and n3 and n2 females than dicofol and untreated plots. The mean density of parasitized females of *C. aonidum* was greater in untreated and dicofol plots than in carbaryl plots. The carbaryl and dicofol treatments had significantly higher fruit drop than the control. It is concluded that repeated applications of carbaryl could increase population densities of *C. aonidum*, by eliminating *A. holoxanthus*.

Reitz, S.R. & Trumble, J.T. 2002. Competitive displacement among insects and arachnids. Annual Review of Entomology 47: 435-465. [ReitzTr2002]

Notes: Competitive displacement is the most severe outcome of interspecific competition. For the purposes of this review, we define this type of displacement as the removal of a formerly established species from a habitat as a result of direct or indirect competitive interactions with another species. We reviewed the literature for recent putative cases of competitive displacement among insects and arachnids and assessed the evidence for the role of interspecific competition in these displacements. We found evidence for mechanisms of both exploitation and interference competition operating in these cases of competitive displacement. Many of the cases that we identified involve the operation of more than one competitive mechanism, and many cases were mediated by other noncompetitive factors. Most, but not all, of these displacements occurred between closely related species. In the majority of cases, exotic species displaced native species or previously established exotic species, often in anthropogenically-altered habitats. The cases that we identified have occurred across a broad range of taxa and environments. Therefore we suggest that competitive displacement has the potential to be a widespread phenomenon, and the frequency of these displacement

events may increase, given the ever-increasing degree of anthropogenic changes to the environment. A greater awareness of competitive displacement events should lead to more studies documenting the relative importance of key factors and developing hypotheses that explain observed patterns. *Phenacoccus manihoti* is one of the species discussed.

Ren, H., Chen, M.R., Yu, H.B., Xu, J.X. & Fang, T.S. 2000. [A newly found native parasitoid, *Anagyrus dactylopii* of loblolly pine mealybug, *Oracella acuta*.] (In Chinese; Summary In English). Natural Enemies of Insects 22(3): 140-143. [RenChYu2000]

Notes: This paper discusses the occurrence and damage of loblolly pine mealybug, *O. acuta* in Guangdong Province, China with its newly found native parasitoid, *A. dactylopii*.

Reus, K.E., Houben, G.F., Stam, M. & Dubois, A.E. 2000. Food additives as a cause of medical symptoms: relationship shown between sulfites and asthma and anaphylaxis; results of a literature review. Nederlands Tijdschrift voor Geneeskunde 144(38): 1836-1839. [ReusHoSt2000]

Notes: To determine if a causal connection exists between food additives and various medical complaints. Medline over the period January 1966-January 1999 was searched for articles on substances not containing protein and lactose, which includes azo-dyes (cochineal red). Of those studies purporting to demonstrate an effect, only double-blind randomized placebo-controlled studies with oral challenge were assessed further, unless the complaint was anaphylaxis. For azo-dyes, benzoates, MSG, sorbates and BHA/BHT, no link with medical symptoms was demonstrable.

Rios-Aramayo, R. & Jimenez, M. 2000. Do armored scale insects influence visit rate and feeding activity of ants on *Echinopsis chilensis*? Revista Chilena de Entomología 26: 81-84. [RiosArJi2000]

Notes: The feeding activity of the ant *Camponotus hellmichi* was evaluated on *Echinopsis chilensis* Friedr. et Rowl. cacti. The mean number of ant visits was estimated on non-infested *E. chilensis*, on *E. chilensis* infested by the mistletoe *Tristerix aphyllus* Van Tiegh. Ex Barlow et Wiens, and on *E. chilensis* with *T. aphyllus* infested by *Saissetia oleae*. Rate of ants visits to *E. chilensis* with *T. aphyllus* infested by the armored scale insect ($\bar{x} = 15.3$) was twice as much as the other two types of cacti ($\bar{x} = 7.6$). Ants seem to forage for sugary secretions generated by scale insects, however ants do not tend armored scale insects and spend more time feeding on branches of *T. aphyllus* than on scale insects, possibly because most sugar secretions are left over *T. aphyllus*. We hypothesize that there are no mutual benefits between ants and scale insects and therefore it is an opportunistic interaction within *E. chilensis*.

Robb, R.L., Costa, H.S., Bethke, J., Cowles, R. & Parrella, M.P. 2001 (2000). Pests of floricultural and ornamental nurseries. UC Pest Management Guidelines [RobbCoBe2001]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.floriculture.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of floricultural and ornamental nurseries in the U.S., including *Aonidiella aurantii*, *Aspidiotus nerii*, *Coccus hesperidum*, *Hemiberlesia lataniae*, *Lepidosaphes ulmi*, *Phenacoccus gossypii*, *Planococcus citri*, *Pseudococcus longispinus*, *Pulvinaria psidii*, *Quadrapsidiotus perniciosus*, *Rhizoecus* sp., *Saissetia coffeae* and *S. oleae*.

Rochat, J. & Gutierrez, A.P. 2001. Weather-mediated regulation of olive scale by two parasitoids. Journal of Animal Ecology 70(3): 476-490. [RochatGu2001]

Notes: The effects of temperature and interspecific competition among two parasitoids (*Aphytis maculicornis* (=paramaculicornis) (Masi)-*Coccophagoides utilis* Doutt) of the olive scale (*Parlatoria oleae* (Colvee)) were examined, and the reason for the successful biological control of olive scale explained. An age-structure distributed maturation time model of this system was developed that simplifies many of the details of prior physiologically based models. Temperature-dependent physiological indices were used to scale fecundity and survivorship rates from their maximum values. The distributed maturation time population dynamics model captured the variance in temperature-related development times required to simulate the dynamics of the system. A type III ratio-dependent functional response was used to estimate parasitism rate on olive scale and also served to stabilize our single patch model. The

model confirms the Huffaker & Kennett (1966) conclusions concerning the role of weather and the relative contribution of the two parasitoids in the regulation of olive scale in California olive.

Rodriguez, L.C. & Niemeyer, H.M. 2000. [Indirect evidence on the origin of the cochineal, *Dactylopius coccus* (Hemiptera: Dactylopiidae).] Revista Chilena de Entomología 27: 85-89. [RodrigNi2000]

Notes: Literature data is surveyed under the light of ecological theory in order to determine the origin (North or South America) of cochineal, *Dactylopius coccus*. Phylogenetic analysis of the genus *Dactylopius*, evidence of competition between *Dactylopius* species, and the change of a relevant character for competition in *D. coccus* strengthen the hypothesis than *D. coccus* in North America is a colonizing species and its disjoint distribution suggests that it was transported from the Andean Area to North America by sea.

Rohrbach, K.G., Christopher, D., Hu, J., Paull, R., Sipes, B., Nagai, C., Moore, P., McPherson, M., Atkinson, H., Levesley, A., Oda, C. & Fleisch, H. 2000. Management of a multiple goal pineapple genetic engineering program. Acta Horticulturae No. 529: 111-113. [RohrbChHu2000]

Notes: [Proceedings of the Third International Pineapple Symposium, Pattaya, Thailand, 17-20 November 1998.] The pineapple genetic engineering programme, which has multiple goals focusing on nematode resistance, pineapple mealybug wilt virus resistance, flowering and fruit ripening control, and fruit quality, was initiated in 1995. The programme involves collaboration between the University of Hawaii, the University of Leeds, UK, the Hawaii Agriculture Research Centre (formerly the Hawaii Sugar Planter Association), the United States Department of Agriculture-Agricultural Research Service, DNAP, and the Pineapple Growers Association of Hawaii.

Rojas, T. 2000. *Aschersonia basicystis* on scale insects (Homoptera: Coccidae) in Venezuela. Revista Iberoamericana De Micología 17(4): 135-137. [Rojas2000]

Notes: The fungus *Aschersonia basicystis* on soft scales; tortoise scales and wax scales (Homoptera: Coccidae) is described and illustrated on the basis of the examination of Venezuelan collections, using transmitted light and differential interference contrast optical microscopy.

Rubio, J.M. & Melo, V. 2001. From the field to the table edible insects indigenous food. Conference 11th World Congress of Food Science, Seoul (Korea), 22-27 Apr 2001 [RubioMe2001]

Notes: *Dactylopius coccus costa* is among the species discussed.

Rubio, J.M., Salas, J., Nogeda, N. & Melo, V.A.F. 2001. [Cochineal carmine insect *Dactylopius coccus costa* natural deep red colorant used in food industry/] Conference 11th World Congress of Food Science, Seoul (Korea), 22-27 Apr 2001 [RubioSaNo2001]

Notes: *Dactylopius coccus costa* is among the species discussed.

Rue, B.L. & Makosso, J.P.M. 2001. Prey habitat location by the cassava mealybug predator *Exochomus flaviventris*: olfactory responses to odor of plant, mealybug, plant-mealybug complex, and plant-mealybug-natural enemy complex. Journal of Insect Behavior 14(5): 557-572. [RueMa2001]

Notes: *Exochomus flaviventris* Mader is considered to be the most active predator of the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero in Central Africa. The response of experienced gravid female coccinellids to the odor of cassava plant (var. Zanaga), unparasitized mealybugs, plant-mealybug complex with or without feeding prey (parasitized or not), and plant-mealybug complex with or without conspecific coccinellids was investigated in a Y-tube olfactometer. The odor of uninfested cassava plants was not more attractive than clean air. Dual-choice tests revealed that mealybug-infested plants were preferred to mealybugs alone and mealybug-damaged plants were the major sources of volatiles that attract female coccinellids to the microhabitat of its prey. The emission of volatile chemicals did not appear to be limited to the infested parts of the plant but did occur systemically throughout the plant. The presence of conspecific coccinellid larvae or adult males did not modify the attractiveness of the mealybug-infested plants. However, when an infested plant with conspecific predator females (alone or with conspecific males) was compared to an infested plant or infested plant with conspecific males, *E. flaviventris* females showed a preference for the last two sources of odor. The uninfested plant with conspecific males was also preferred to the uninfested plant with conspecific females.

In addition, the odor of conspecific males was preferred over that of conspecific females. Female predators preferred the plant infested with unparasitized mealybugs to the plant infested with mealybugs previously parasitized. These results showed that *E. flaviventris* females use herbivore-induced plant volatiles during foraging and can detect via olfaction the presence of conspecific gravid females and parasitized prey, thus assessing patch suitability from a distance.

Rue, B.L. & Mitsipa, A. 2000. Influence of the host plant of the cassava mealybug *Phenacoccus manihoti* on life-history parameters of the predator *Exochomus flaviventris*. Entomologia Experimentalis et Applicata 5(2): 209-212. [RueMi2000]

Notes: N/A

Russo, A., Mazzeo, G., Suma, P. & Longo, S. 2001 (1999). Bionomics of *Dactylopius coccus* Costa (Hemiptera: Coccoidea) in a greenhouse in Sicily. Entomologica 33(1999): 333-338. [RussoMaSu2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] A study on the biology of *Dactylopius coccus* Costa was undertaken to evaluate the possibility of mass-rearing it commercially in Sicily. The colonies of *D. coccus* were maintained on 2-3 years old cladophylls of *Opuntia ficus indica*, rooted in plant pots, in a greenhouse near the Faculty of Agricultural Sciences, the University of Catania. Almost daily observations were made between April 1995 and August 1996. Three reproductive cycles of the scale insect were observed; the duration of each instar, the length of each life cycle, female fecundity and the effects of the biotic factors have been studied.

Sacco, M., Pasini, C., D'Aquila, F., Fadelli, P., Tommasini, M.G. & Sekeroglu, E. 2000. First experiences in Italy of IPM on ornamental cut foliage: *Danae racemosa* and *Fatsia japonica*. IOBC-WPRS Working Group "Integrated Control in Protected Crops, Mediterranean Climate" 23(1): 3-8. [SaccoPaD2000]

Notes: On the Northwest coast of Italy, ornamentals and cut foliage are the main cultivated crops. Among cut foliage crops, *Ruscus (Danae racemosa)* and *Fatsia (Fatsia japonica)* are two of the most important. To enhance the quality of these products, the application of integrated pest management (IPM) using natural enemies has begun. Parasitoids and predators, as for example, *Cryptolaemus montrouzieri* against scales (*Icerya purchasi*, *Planococcus citri*, *Saisettia oleae* and *Protopulvinaria pyriformis*). Due to the absence of effective natural enemies and its resistance to selective pesticides, *P. pyriformis* is an obstacle to the development of IPM for Fatsia.

Sadof, C. 2000. Bringing scale problems down to size. TurfGrass Trends 8(6): 6-8. [Sadof2000]

Notes: Basic field description, their behavior, destruction and suggestions for control of soft, kermes, and bark scales, mealybugs, margarodids, and ensign scales.

Sagarra, L.A., Vincent, C. & Stewart, R.K. 2001. Body size as an indicator of parasitoid quality in male and female *Anagyrus kamali* (Hymenoptera : Encyrtidae). Bulletin of Entomological Research 91(5): 363-367. [SagarViSt2001]

Notes: The parasitoid *Anagyrus kamali* Moursi was recently introduced into the Caribbean as a biological control agent against the hibiscus mealybug, *Maconellicoccus hirsutus* Green. In the laboratory, parasitoid size, as measured by left hind tibia length, was positively correlated with several indicators of the parasitoid's fitness: longevity, mating preference, fecundity, reproductive longevity, progeny emergence and sex-ratio. When fed ad libidum with honey drops, large male parasitoids lived significantly longer than small ones. Large females also lived significantly longer than small females. Females showed no significant mating preference between large and small males. Lifetime fecundity was positively correlated with the size of adult females. The reproductive longevity, daily oviposition rate, and number of progeny were also higher among large parasitoids. The sex ratio of progeny from small female parasitoids was higher than that of large individuals.

Sagarra, L.A., Vincent, C. & Stewart, R.K. 2001a. Suitability of nine mealybug species (Homoptera: Pseudococcidae) as hosts for the parasitoid *Anagyrus kamali* (Hymenoptera: Encyrtidae). Florida Entomologist 84(1): 112-116. [SagarViSt2001a]

Notes: The parasitoid *Anagyrus kamali* Moursi [Hymenoptera: Encyrtidae] has been recently introduced into the Caribbean as a biological control agent against the Hibiscus Mealybug, *Maconellicoccus hirsutus* Green [Homoptera: Pseudococcidae]. In order to understand host/parasitoid ecological interactions and optimize the mass-production system of this parasitoid, eight mealybug species (*Planococcus citri* (Risso), *Planococcus halli* Ezzat & McConnel, *Dysmicoccus brevipes* (Cockerell), *Pseudococcus elisae* Borchsenius, *Saccharococcus sacchari* (Cockerell), *Puto barberii* (Cockerell), *Nipaecoccus nipae* (Newstead), *Plotococcus neotropicus* (Williams & Granara de Willink) common to Trinidad were tested to determine their potential as alternative hosts for the parasitoid. Susceptibility, preference and suitability tests were conducted. In addition to *M. hirsutus* (4.5 plus or minus 2.04 hosts parasitized per female parasitoid in 30 min), *Planococcus citri* (1.1 plus or minus 1.23 hosts parasitized) and *Planococcus halli* (0.8 plus or minus 1.41 hosts parasitized) were the only species parasitized. However, the parasitoid did not complete its development in the latter two hosts. Out of nine mealybug species, *M. hirsutus* was the only suitable host for the complete development of *A. kamali* progeny. This level of host specificity by *A. kamali* may prevent adverse effect to other Caribbean mealybug species.

Sahoo, A.K. & Ghosh, A.B. 2000. Biology of the mealybug *Rastrococcus invadens* Williams. Environment & Ecology 18(3): 752-756. [SahooGh2000]

Notes: The biology and life cycle of the mealybug, *Rastrococcus invadens* in India.

Sahoo, A.K. & Ghosh, A.B. 2001. Descriptions of all instars of the mealybug *Planococcus minor* (Maskell) (Homoptera, Pseudococcidae). Environment & Ecology 19(2): 436-445. [SahooGh2001]

Notes: Descriptions with illustrations and a key to the identification of all instars of the mealybug *Planococcus minor* (Maskell) are given. The first instar nymphs, second instar nymphs of male and female, third instar nymphs of female and adult females have 18 pairs of cerarii. The first instar nymphs and second instar nymphs of male and female have 6-jointed antennae. The first instar nymphs bear trilocular pores on dorsum only. The second instar nymphs of male possess oral collar tubular ducts on both the surface of the body whereas the females have these ducts on dorsum only. The third nymphal female and adult female have 7- and 8-segmented antenna respectively. The third and fourth instar nymphs of male have a pair of wingbuds and a pair of wings respectively.

Sarkissov, R.N., Mkrtchian, L.P. & Zakharian, V.A. 2001 (1999). A technique to obtain the eggs of the ararat cochineal. Entomologica 33(1999): 273-274. [SarkisMkZa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. Ararat cochineal (*Porphyrophora* sp.) produces a valuable, light-resistant red carmine dye. To protect this rare species and to increase its productivity, a technique for breeding it under artificial conditions has been developed. This has allowed a 5-6 times increase in body-mass yield and, therefore, of dye. The most laborious part of the technique is gathering the eggs during the spring and summer from wild plants for use in the greenhouse. We have improved this technique. We now use wooden boxes (50 x 50 x 15 cms), with the bottom covered with gauze. The boxes are filled with 10 cm of soil derived from cochineal areas. Adult male and female cochineal insects are then placed in the boxes. Once fertilized, the females dig themselves into the soil, form the ovisac and lay their eggs. After 30-50 days, the boxes are transferred to cochineal natural areas and dug into the ground, level with the soil surface. The boxes are then maintained under these field conditions from November through to February, so that the eggs hibernate under natural conditions. The boxes are then collected and transferred to the laboratory, where the eggs are collected and are either for the spring infection of plants or are kept in the refrigerator to infect plants in the summer. This has proved to be a very labour-saving technique.

Schmidt, S., Naumann, I.D. & De Barro, P.J. 2001. *Encarsia* species (Hymenoptera : Aphelinidae) of Australia and the Pacific Islands attacking *Bemisia tabaci* and *Trialeurodes vaporariorum* (Hemiptera : Aleyrodidae) - a pictorial key and descriptions of four new species. Bulletin of Entomological Research 91(5): 369-387. [SchmidNaDe2001]

Notes: After the recent introduction of the pest whitefly *Bemisia tabaci* (Gennadius) biotype B into Australia, research was undertaken to study the parasitoids of the long established native *B. tabaci* and *Trialeurodes vaporariorum* (Westwood). The genus *Encarsia* contains species which are important biological control agents of whiteflies and hard scales.

Schmutterer, H. 2000. [Observations on scale insects found for the first time in Germany and found on some poorly known species (Coccina)]. (In German; Summary In English). Entomologische Nachrichten und Berichte 44: 165-170. [Schmut2000]

Notes: [Original title: Bemerkungen über in Deutschland erstmalig nachgewiesene und einige weitere, wenig bekannte Schildlausarten (Coccina).] During the early fifties of the 20th century and in recent years (1998-2000) 19 species of scale insects were collected in Germany, which were not recorded in this country before. Most of them were pseudococcids, some eriococcids and coccids. The list of German scale insects comprises now about 131 species. Four species had to be deleted from the list. It is expected that further scale insect species new to the German fauna will be found in future, mainly pseudococcids. Some species may immigrate from neighboring countries in western Europe, especially if the greenhouse effect will result in an increase of the average temperature.

Schmutterer, H. 2001 (1999). The scale insects, whiteflies, aphids and psyllids of the neem tree, *Azadirachta indica* (Meliaceae). Entomologica 33(1999): 339-345. [Schmut2001]

Notes: [Special issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye (UK) August 31st - September 6th 1998.] The neem tree, *Azadirachta indica* (Meliaceae), is attacked by numerous scale insect species, mainly diaspidids, coccids and pseudococcids, as well as a few species belonging to other families in the Sternorrhyncha, *Aonidiella orientalis* (Newstead) is the most important pest of neem; others such as *Pinnaspis strachani*, *Chrysomphalus aonidum* and *Pulvinaria jacksoni* are minor pests of local importance. Water stress or unsuitable soil conditions in Africa and elsewhere may reduce the resistance of the trees and, therefore, increase the probability of outbreaks. Most scale insects attacking neem are more or less polyphagous species. The closely-related chinaberry tree, *Melia azedarach*, is also attacked by many scale insect species, suggesting that neither of these closely related plants can protect themselves against those scale insects species which can either avoid the tissues containing the active ingredients or are naturally resistant to them.

Schreiber, S.J., Mills, N.J. & Gutierrez, A.P. 2001a. Host-limited dynamics of autoparasitoids. Journal of Theoretical Biology 212(2): 141-153. [SchreiMiGu2001a]

Notes: Autoparasitoids, an important class of intraguild predators used in classical biological control, have a unique biology. Females develop as primary endoparasitoids of scale insects and whiteflies. Males develop at the expense of conspecific or heterospecific parasitoid prepupae. To evaluate the effect of autoparasitism on host suppression, system stability, and parasitoid coexistence, stage-structured differential equation models are developed and analysed. For a host-parasitoid system, autoparasitism stabilizes host-parasitoid oscillations generated by developmental delays of the parasitoid. In host-autoparasitoid-primary parasitoid systems, a distinction between obligate (i.e. parasitoid only attacks conspecifics for the production of males) and facultative (i.e. parasitoid attacks conspecifics and heterospecifics for the production of males) autoparasitism is drawn. Coexistence between an obligate autoparasitoid and primary parasitoid occurs if and only if the autoparasitoid can invade at lower host densities than the primary parasitoid, and the primary parasitoid can suppress the host to a lower equilibrium density than the autoparasitoid. When coexistence occurs, the primary parasitoid determines the host equilibrium abundance. Interactions between facultative autoparasitoids and primary parasitoids can lead to a priority effect, and, less likely, to coexistence. When coexistence occurs, the invasion of the facultative autoparasitoid into the host-primary parasitoid system raises the equilibrium density of the host. In either coexistence scenario, the invasion of an autoparasitoid can stabilize an unstable host-primary parasitoid system. The analysis concludes by showing that the introduction of an autoparasitoid to a host-primary parasitoid system can improve host suppression in the short-term despite possible long-term disruption.

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Seljak, G. 2001. [Pulvinaria hydrangeae Steinweden (Homoptera, Coccidae) - a new soft scale species in Slovenia.] *Pulvinaria hydrangeae* Steinwedenn (Homoptera, Coccidae) - nova vrsta kaparja v sloveniji. (In Slovenian; Summary In English). Zbornik predavanj in referatov 4. Slovenskega Posvetovanja o Varstvu Rastlin 337-343. [Seljak2001] Notes: The cottony hydrangea scale (*Pulvinaria hydrangeae* Steinweden) is a new soft scale species for Slovenia. The Slovene population originates evidently from Italy. At the moment it is already diffused in Brda, in the Valley of Soca and Vipava, as well as in the Slovene Istria. In the present paper the morphology and the taxonomy of this species are described in comparison with other species of the genus *Pulvinaria* known up to the present in the territory of Slovenia.

Serrano, M.S., Lapointe, S.L. & Meyerdirk, D.E. 2001. Attraction of males by virgin females of the mealybug *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae). Environmental Entomology 30(2): 339-345. [SerranLaMe2001]

Notes: The mealybug *Maconellicoccus hirsutus* (Green) has extended its range throughout the Caribbean region since it was first detected in Grenada in 1991, and has recently been detected in Southern California, Mexico, and Central America. Laboratory and field experiments using virgin females were conducted on St. Croix, U.S. Virgin Islands, to determine if females attract males with pheromones. Virgin females isolated in gelatin capsules attracted on average one male to each capsule over a period of 18 h in the laboratory compared with gelatin capsules without females. Adhesive traps baited with virgin females and placed on hibiscus, *Hibiscus rosa-sinensis* L., in the field, captured more males at all three study localities on St. Croix than did unbaited traps. Virgin females attracted more males than controls at 0-10 m from infested hibiscus, but were capable of attracting males at 50 m distance from an infestation. The attractiveness of virgin females to flying males strongly suggests the involvement of a female-produced sex pheromone. Isolation and synthesis of such a sex pheromone would provide a valuable tool for population monitoring and control of this invasive pest.

Sether, D.M. & Hu, J.S. 2001. The impact of Pineapple mealybug wilt-associated virus-1 and reduced irrigation on pineapple yield. Australasian Plant Pathology 30(1): 31-36. [SetherHu2001]

Notes: The impacts of Pineapple mealybug (*Dysmicoccus brevipes*) wilt-associated virus-1 (PMWaV-1) and reduced irrigation on pineapple fruit yield in plant and ratoon crops were evaluated in a field experiment in Hawaii. In the plant crop, PMWaV-1 infection and reduced irrigation had no significant effects on fruit weight. In the ratoon crop, plants infected with PMWaV-1 produced smaller fruit than disease-free plants and plants that received reduced irrigation also produced smaller fruit than plants that received regular irrigation. Additive effects of PMWaV-1 infection and reduced irrigation were detected; plots of infected plants that received reduced irrigation produced the fewest fruit. Frequency distributions for fruit size in the ratoon cycle showed shifts to smaller sized fruit classes when PMWaV-1 or reduced irrigation were present. Estimated yield from combined plant and ratoon crops for infected plants was 6.7% less than disease-free plants when plants received regular irrigation. Reduced irrigation correlated with a 4.2% reduction in estimated yield of disease-free plants, and both infection and irrigation reduction together reduced yield 13.4%. These results show that PMWaV-1 and reduced irrigation can have a negative and additive impact on pineapple fruit production in the first ratoon.

Sether, D.M., Karasev, A.V., Okumura, C., Arakawa, C., Zee, F., Kislan, M.M., Busto, J.L. & Hu, J.S. 2001. Differentiation, distribution, and elimination of two different pineapple mealybug wilt-associated viruses found in pineapple. *Plant Disease* 85(8): 856-864. [SetherKaOk2001]

Notes: Surveys for Pineapple mealybug (*Dysmicoccus brevipes*) wilt-associated virus-1 (PMWaV-1) and PMWaV-2 were conducted on pineapple samples from Hawaii and around the world. Tissue blot immunoassays (TBIA) with two different monoclonal antibodies (MAb) specific to either PMWaV-1 or PMWaV-2 indicated that both closteroviruses are widely distributed throughout the pineapple-growing areas of the world. In the worldwide survey, PMWaV-1 was found in 801 of the mealybug wilt of pineapple (MWP)-symptomatic and 78% of the asymptomatic pineapple plants tested. A subset of plants was tested for PMWaV-2; 100% of the symptomatic plants and 1246 of the asymptomatic plants were positive for this virus. A reverse transcription-polymerase chain reaction (RT-PCR) assay was developed to differentiate between PMWaV-1 and PMWaV-2. Oligonucleotide primers were designed using distinct regions of the HSP 70 homolog genes of the two viruses. PMWaV-specific RT-PCR assays and TBIA were used to screen the pineapple accessions maintained at the United States Department of Agriculture-Agricultural Research Service National Clonal Germplasm Repository for PMWaV infection; 73% of the accessions were found infected with at least one PMWaV. Pineapple accessions found PMWaV-free were challenged with viruliferous mealybugs to test for immunity to PMWaV-1. No immune germ plasm was identified. Potential alternative virus hosts were screened for infection with virus-specific RT-PCR assays and TBIA and were also challenged with viruliferous mealybugs. No alternate hosts of PMWaV-1 or PMWaV-2 were identified. PMWaV-1 infection was eliminated through axillary and apical bud propagation from infected crowns. Strategies to manage MWP are discussed.

Sforza, R. & Greif, C. 2000. [Mealybugs and grapevine leafroll. Phytopathological and ethological data.] Les cochenilles et l'enroulement viral de la vigne. Donnees de phytopathologie et d'ethologie. (In French). *Phytoma La Defense des Vegetaux* (France) (no. 532): 46-50. [SforzaGr2000]

Notes: This paper reviews *Heliochoccus boemicus*, *Parthenolecanium corni*, *Phenacoccus aceris* and *Pulvinaria vitis*.

Sforza, R. & Greif, C. 2000a. [To pay attention to scales on grapevine]. La vigne. Les cochenilles: attention danger. (In French). *Vigneron Champenois* (France) 121(8): 22-28. [SforzaGr2000a]

Notes: Three species are considered virus vectors: *Parthenolecanium corni*, *Heliochoccus boemicus* and *Phenacoccus aceris*.

Shree, M.P. & Manjunatha, S. 2000. Incidence of black scale insects (*Saissetia nigra*, N.) infesting mulberry in Kanakapura Taluk (Bangalore Rural District, Karnataka State). *Entomon* 25(2): 91-96. [ShreeMa2000]

Notes: Kanakapura Taluk in the Bangalore rural district is one of the leading places in Karnataka State practicing sericulture. The total area under mulberry cultivation is about 6817.76 hectares; of this, 6812.46 hectares are irrigated. Black scale insects suck the cell sap and kill the plants. The surface of the attacked stems is covered all over with scales. The lenticels are completely hidden, and so respiratory and lenticular transpiration rate of the plant cells are considerably lowered. In the present study, an extensive survey was undertaken for two years (July 1995 to June 1997) at monthly intervals on the infestation of black scale insects on mulberry plants (Kanva2 or M5 variety) in twenty villages of Kanakapura taluk. The data revealed that the infestation by black scale insects was maximum in the month of December and January while it was minimum in the months of May and July. Infestation was not seen in the months of October and February. There was a significant negative relationship between the infestation and climatic factors viz., temperature (maximum) and relative humidity whereas rainfall was not significant.

Sibbett, G.S., Van Steenwyk, R.A. & Ferguson, L. 2000. Pests of olive. UC Pest Management Guidelines [SibbetVaFe2000]

Notes: [<http://www.ipm.ucdavis.edu/PMG/selectnewpest.olives.html>] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of olive in the U.S., including *Aonidiella aurantii*, *Aspidiotus nerii*, *Hemiberlesia lataniae*, *H. rapax*, *Parlatoria oleae* and *Saissetia oleae*.

Silva, E.M.B. & Mexia, A. 2001 (1999). Histological studies on the stylet pathway, feeding sites and nature of feeding damage by *Planococcus citri* (Risso) (Homoptera: Pseudococcidae) in sweet orange. Entomologica 33(1999): 347-350. [SilvaMe2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Histological studies on the stylet pathway, feeding sites and cell damage caused by the citrus mealybug, *Planococcus citri* (Risso), on sweet orange (*Citrus sinensis* (L.) Osbeck) fruit and leaves are described. The frequency of stylet pathways that were exclusively intercellular did not differ significantly from those that were both inter- and intracellular. Stylet track terminations were significantly more frequent in the phloem and its proximity than elsewhere, indicating that the phloem was the preferred feeding site in both fruits and leaves. None of the observed stylet tracks had multiple branches. The majority of plant cells surrounding the stylet tracks showed no detectable damage; only in the fruit did some cells appear slightly enlarged and had a different pigmentation, suggesting that the damage was caused by diffusion of saliva from the stylet. The pierced cells appeared otherwise healthy.

Smaili, C., Afellah, M. & Aarab, A. 2000. [Some elements of the biology of *Lepidosaphes beckii* New. (Hom. Diaspididae) in clementine orchards in the region of Gharb (Morocco).] Quelques éléments de biologie de *Lepidosaphes beckii* New. sur clementinier dans la région du Gharb (Maroc). (In French; Summary In English). Mededelingen Faculteit Landbouwkundige Universiteit Gent 65(2a): 281-290. [SmailiAfAa2000]

Notes: This research was carried out at INRA experiment station El Menzeh on a Clementine orchard during 1998 and 1999. The purpose was to study evolution and ecology of *Lepidosaphes beckii*, and infestations of leaves. Results show that this species was present year round. The pest population level varies annually and seasonally. Mortality factors contributing to the reduction of the species were parasitism by *Aphytis lepidosaphes*, predation and climate.

Smith, S.F. & Krischik, V.A. 2000. Effects of biorational pesticides on four coccinellid species (Coleoptera: Coccinellidae) having potential as biological control agents in interiorscapes. Journal of Economic Entomology 93(3): 732-736. [SmithKr2000]

Notes: The direct toxicity of insecticidal soap, horticultural oil, Azatin, an extract from the Neem tree containing azadirachtin, and BotaniGard, a commercial formulation of the entomopathogenic fungus *Beauveria bassiana*, was assessed on adults of four species of coccinellids - *Hippodamia convergens* (Guerin-Meneville), *Coleomegilla maculata* (DeGeer), *Harmonia axyridis* Pallas, and *Cryptolaemus montrouzieri* Mulsant. All biorationals caused less mortality than a conventional pesticide, carbaryl (Sevin). Horticultural oil (Sunspray ultrafine oil) consistently had no effect on beetle survivorship. Insecticidal soap (M-Pede) significantly reduced survival in all replicates for *C. maculata* and in at least one of the three replicates for the other three coccinellid species. *Beauveria bassiana* (BotaniGard) significantly reduced survival of *C. montrouzieri* at 72 h after spray in all three replicates. Azatin reduced survivorship in only one species, *C. maculata*, in only one of the three replicates. *Planococcus citri* is one of the common interiorscape pests mentioned.

Soria, S., Moreno, M., Viñuela, E. & Estal, P. del 2000a. [First detection of *Diaspis cocois* (Lichtenstein) on Palmaceae in Spain. Localización en España de *Diaspis cocois* (Lichtenstein 1882) sobre Palmera. (In Spanish; Summary In English). Boletín de Sanidad Vegetal, Plagas 26(3): 317-321. [SoriaMoVi2000a]

Notes: *D. cocois* [*Diaspis boisduvalii*], a typical pest of many species of *Palmae* [Arecaceae], has spread throughout some regions of the World and its occurrence in Malaga, Spain, attacking *Arecastrum romanoffianum* is reported for the first time.

Soria, S., Moreno, M., Viñuela, E. & Estal, P. del. 2000. [Scale insects on *Pinus* spp. in Spain.] Principales cochinillas en los pinos españoles. (In Spanish; Summary In English). Boletín de Sanidad Vegetal, Plagas 26(3): 335-348. [SoriaMoVi2000]

Notes: Ten species of Coccoidea on pines in Spain are reviewed here. *Puto superbus* was recorded for the first time in Spain. *Coccus hesperidum* was recorded for the first time on this host in Spain. The importance of *Anamaspis lobi*, *Dinaspidotus britannicus*, *Gomezmenoraspis pinicola*, *Leucaspis pini*, *L. pusilla*, *Matsucoccus feytaudi*, *M. matsumurae* and *Paleococcus fuscipennis* are discussed.

Souza, B. & Santa Cecilia, L.V.C. 2000. [Stage density of *Dysmicoccus brevipes* (Cockerell) (Hemiptera: Pseudococcidae) in six hosts.] Densidade de estadios de *Dysmicoccus brevipes* (Cockerell) (Hemiptera: Pseudococcidae) em seis hospedeiros. (In Portuguese; Summary In English). Revista Ceres 47(272): 457-460. [SouzaSa2000]

Notes: This survey was carried out to study the behavior of pineapple mealybug *Dysmicoccus brevipes* in different hosts under greenhouse conditions in Lavras-MG, Brazil. The hosts used were *Arachis hypogaea*, *Oryza sativa*, *Coffea arabica*, *Citrus sinensis*, *Cyperus rotundus* and *Ananas comosus* (test). Plants were inoculated with ten mealybug females per plant and after 40 days, a reduced number of mealybugs was observed in plants of *A. hypogaea*, *O. sativa*, *C. arabica* and *C. rotundus*, in contrast with the greatest number of colonies developing on pineapple plants. The occurrence of this pest was not observed in citrus.

Spina, M.Ia 2001. [Pyriform cochineal (*Protopulvinaria pyriformis* Cockerell) infestations in avocado plantules grown from seeds.] (In Italian; Summary In English). Informatore Fitopatologia 51(6): 64-66. [Spina2001]

Notes: *Protopulvinaria pyriformis* infestations in Valencia, Spain were detected in propagules grown from seeds. The occurrence of *P. pyriformis* in avocado propagules grown from seeds was also discovered in the area. After a short account on avocado growing, the origin, geographical distribution and morphological characteristics of *P. pyriformis* are presented. Damages incurred by this pest and the chemical and biological measures for its control are also included. The use of chemical control is advisable only during high infestation rates.

Stadler, B., Fiedler, K., Kawecki, T.J. & Weisser, W.W. 2001. Costs and benefits for phytophagous myrmecophiles: when ants are not always available. Oikos 92(3): 467-478. [StadleFiKa2001]

Notes: Costs and benefits in mutualistic associations between ants and phytophagous myrmecophiles are context dependent. We collected information from the literature on costs and benefits of myrmecophily in aphids, coccids, membracids and lycaenids. A key result of the literature survey is that investment in mutualism with ants entails costs paid not only when ants are present (direct costs) but also when they are absent (indirect costs). We incorporated such a trade-off in a model that investigates the fitness consequences of the decision of a potential myrmecophile whether or not to invest in cooperation with ants. The model shows that whether myrmecophily should be favoured depends on the rate of increase of the population, and, if there are indirect costs, on the frequency of habitats with ants. Both direct and indirect costs can limit or prevent the evolution of myrmecophily even when ants are abundant. To understand the patterns of associations in the field we therefore need to measure the benefits and costs of myrmecophily both in the presence and in the absence of ants.

Stathas, G.J. 2001. Ecological data on predators of *Parlatoria pergandii* on sour orange trees in southern Greece. Phytoparasitica 29(3): 207-214. [Statha2001]

Notes: The present study was carried out in southern Greece during 1993-1995 on sour orange trees infested with the diaspidid *Parlatoria pergandii* Comstock. The activity of the natural enemies of the scale, the composition of their population during the year as well as their relation with hymenopterous parasitoids of coccinellids, were studied. *P. pergandii* was parasitized by a hymenopterous endoparasite of the genus *Encarsia* and the extent of parasitization ranged between 5.2% and 14.1%. The observed predators were the coccinellids *Chilocorus bipustulatus* Linnaeus and *Rhyzobius lophanthae* Blaisdell and the nitidulid *Cybocephalus fodori* Endrody-Younga. The predominant predator was *R. lophanthae* (84.3% of the larvae and 73.3% of the adults), which was active throughout the whole year in all of its developmental stages. Second most abundant was the predator *C. bipustulatus* (15.7% of the larvae and 20% of the adults) and third the predator *C. fodori* (6.7% of the adults). Larvae of *C. bipustulatus* were observed to be parasitized by the hymenopterous parasitoids *Homalotylus laminius* Dalman (Encyrtidae) and *Tetrastichus coccinellae* Kurdjumov (Eulophidae). The parasitization percentage increased gradually from 4% in mid-June to 94% around the end of September. Laboratory tests confirmed that the above-mentioned parasitoids cannot infest larvae or nymphs of *R. lophanthae*.

Stathas, G.J. 2001a. The scale *Nemolecanium graniformis* (Wunn) (Homoptera: Coccoidea) in Greece. Anzeiger für Schädlingskunde 74(3): 57-59. [Statha2001a]

Notes: The phenology and natural enemies of *Nemolecanium graniformis* (Wunn)(Homoptera: Coccoidea) in infesting *Abies cephalonica*, were studied in Greece during 1998-1999. This oviparous species develops one generation per year

in Central Greece (Attica) and overwinters as 2(nd) instar nymph. Young adult females appear by the end of July, and the first instar nymphs by the middle of August. By the middle of October, the whole population of the scale is recorded as 2(nd) instar nymphs. The parasitoids *Coccophagus lycimnia* (Walker), *Coccophagus* Westwood sp., *Aphycoides* Mercet sp. and the predator *Exochomus quadripustulatus* L. (Coleoptera: Coccinellidae), were observed as natural enemies of the scale. The average fecundity of *N. graniformis* was 188.4 eggs.

Stathas, G.J. 2001b. Studies on morphology and biology of immature stages of the predator *Rhyzobius lophantheae* Blaisdell (Col.: Coccinellidae). Anzeiger für Schädlingskunde 74(5): 113-116. [Statha2001b]

Notes: Morphological characteristics of immature developmental stages of *Rhyzobius lophantheae* Blaisdell (Col.: Coccinellidae), predator of scale insects of the family Diaspididae (Homoptera), are described. Data about the morphology of eggs, the four larval instars, and the pupa is presented. Larval instars are described in more detail: size of head capsule, length of tibia, distribution of dorsal and lateral setae of abdomen segments for each larval instar is reported. Distribution of spiracles is also given. Study on the biology concerns the influence of prey on the duration of instar periods. The diaspidids *Aspidiotus nerii* and *Aonidiella aurantii* were used as food. The mean duration of the developmental period from egg to adult was 27.1 days, and no mortality was observed (0%) when *A. nerii* was used as prey. The respective numbers when the prey was *A. aurantii* were 48.8 days and 84%.

Stimmel, J.F. 2000. Hemlock scale, *Abgrallaspis ithacae* (Ferris) Homoptera: Diaspididae. Regulatory Horticulture (PA Dept. of Agric.) 26: 15-17. [Stimme2000]

Notes: Notes on hosts, distribution, field description, life history, damage, economic importance and control.

Strong, D.R. & Pemberton, R.W. 2000. Biological control of invading species--risk and reform. Science 288(5473): 1969-1970. [StrongPe2000]

Notes: Biological control (BC), the science and technology of controlling pests with natural enemies, has had several recent successes, including suppression in Africa of invading mealybug and whitefly pests of cassava by means of introduced wasps. Increasingly, BC is used to suppress weeds in natural areas, such as the ecosystems of South African Cape Fynbos, the Australian Kakadu National Park, and the Florida Everglades, U.S.A.. The everglades BC projects include control of the Old World climbing fern *Lygodium microphyllum*. Biological control is also contemplated against insects invading natural areas and even against invasive marine species. However, BC is not a panacea, and without careful use, it can misfire. Ecologists, conservation groups, and others have raised questions about the safety, rationale, and even the need for some projects. Safeguards to exclude importation of enemies dangerous to the native fauna are in place on very few borders of the world. In the United States, oversight of BC is based on a hodge-podge of old legislation meant for other purposes. Protection of native plants from foreign herbivores imported and disseminated for weed BC has been problematic; meanwhile, native insects and other invertebrates have little protection under the current structure. We suggest reforms that will reduce ecological risk and reinforce the public trust in this powerful technique.

Stumpf, C.F. & Lambdin, P.L. 2001 (1999). Taxonomic status of *Bambusaspis miliaris*, *B. robusta*, and *B. pseudomiliaris* (Hemiptera: Coccoidea: Asterolecaniidae). Insecta Mundi 13(3/4): 205-210. [StumpfLa2001]

Notes: [Publication distributed and postmarked 2001; date printed on issue is 1999.] Based on an assessment of 50 morphological characters from 110 specimens of *Bambusaspis miliaris*, *B. robusta* and *B. pseudomiliaris* from different geographic regions around the world, we conclude that these specimens represent the same species. Therefore, the taxa *B. robusta* and *B. pseudomiliaris* are considered junior subjective synonyms of *B. miliaris*.

Stumpf, F.C. & Lambdin, P.L. 2001a (1999). A comparison of the pit scale genera of North and South America (Hemiptera: Coccoidea: Asterolecaniidae). Entomologica 33: 153-156. [StumpfLa2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Of the 12 Asterolecaniid genera known from the New World, six are believed to have been introduced from other faunal regions. The distinctive morphological characters and generic relationships of the New World species are discussed, along with their biogeography and host plant affinities. In North and South America, the family Asterolecaniidae currently consists of 12 genera: *Asterodiaspis* Signoret, *Asterolecanium* Targioni Tozzetti, *Bambusaspis* Cockerell, *Grammococcus* Miller & Lambdin, *Mycetococcus* Ferris, *Mycococcus*

Ferris, *Neoasterodiaspis* Borchsenius, *Palmaspis* Bodenheimer, *Planchonia* Signoret, *Pollinia* Targioni Tozzetti, *Russellaspis* Bodenheimer and *Sclerosococcus* McKenzie.

Su, H.J. 2000. Development and application of molecular diagnostic probes for detection, characterization, and management of banana viruses. In: Molina, A.B. & Roa, V.N. (Eds.), Advancing banana and plantain R & D [research and development] in Asia and the Pacific: proceedings. International Network for the Improvement of Banana and Plantain - Asia and the Pacific Network, Los Banos, Laguna (Philippines).. 154 pp. [Su2000]

Notes: Pseudococcidae are mentioned.

Sugonyaev, E.S. 2001 (1999). A morphological basis of parasitization strategies of chalcid wasps (Hymenoptera: Chalcidoidea) infesting soft scale insects (Hemiptera: Coccoidea: Coccidae). *Entomologica* 33(1999): 442. [Sugony2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] A study was undertaken of the morphological and biological adaptations of chalcid wasps for the synchronisation of their life cycles with that of the host, so as to provide optimal conditions for parasitization under temperate conditions. This revealed two strategies by the adult wasp for overcoming the period when a suitable host stage is absent. These are referred to here as the "surviving" strategy and the "evasion" strategy. These two strategies are shown by two structural features of the adult wasp: body size and structure of ovipositor and abdomen.

Sugonyaev, E.S. 2001a. [A system of the chalcid wasps (Hymenoptera, Chalcidoidea) adaptations to parasitization on soft scale insects (Homoptera, Coccidae) in the principal climatic zones of Northern Hemisphere] (In Russian). *Entomologicheskoe Obozrenye* 80(1): 8-39. [Sugony2001a]

Notes: Evolution of the adaptive systems of chalcid wasps for parasitization on soft scale insects proceeds by different trends in the Tropic, temperate zone and the Hypoarctic where different biotas and various seasonal cycles of the development of chalcid hosts, namely a polycyclism, monocyclism and hemicyclism, respectively, are common. The main feature of polycyclic development is an overlapping of generations which maintains relatively constant mixed-age structure of host population, while monocyclic and, particularly, hemicyclic seasonal histories are characterized by discrete development of host stages and instars during one or two seasons. Thus, the character of seasonal development together with species richness, high level of competition, and resource fragmentation are responsible for the evolution of the characteristic trophic links of chalcid wasps in the Tropic. Their main feature is the habitat preference when a parasitic female infests in particular habitat host individuals of all ages or only of some definite age, but of a very wide taxonomic range. Under such circumstances, an outstripping strategy of parasitization has arisen with a trend to infesting younger stages (instars) of the host. This strategy is best manifested in arising of the specific guild of chalcidoid parasites, not known in the temperate zone; it is peculiar for infesting only the 1st instar larvae of the host. Morphological adaptations of adults ensure their moderately prolonged imaginal life necessary for host search and reproductive success. In the temperate zone and the Hypoarctic, where host species richness progressively decreases from low to high latitudes, while the discreteness between the life cycle stages of hosts during the season increases, high host specificity and complicated seasonal cycles of chalcid wasps are usual. Two main strategies of parasitization of hosts by chalcid wasps aim at overcoming of the hostless period and ensuring the optimal meeting of a mature parasitic female and a host individual of definite stage (instar) fitting the infestation criteria that arise in these zones. The survival strategy is characterized by a prolonged life of a comparatively large-sized adult female which can live for about a year. The evasion strategy is, vice versa, characterized by a delicate, ephemerized adult and comparatively long preimaginal stages.

Sulaiman, S.F.M., Subhadrabandhu, S. (Ed.) & Chairidchai, P. 2000. Implications of the use of excess coir dust mulch in pineapple cultivation on the mealybug wilt disease of pineapple. *Acta Horticulturae* No. 529: 221-235. [SulaimSuCh2000]

Notes: [Proceedings of the Third International Pineapple Symposium, Pattaya, Thailand, 17-20 November 1998.] Mealybug wilt disease of pineapple is a major problem in pineapple production. The pink pineapple mealybug, *Dysmicoccus brevipes*, causes the wilt disease. Ants attending the mealybug colonies play a major role in the build-up

of the mealybug colony and thereby the disease. Pineapple is planted in rows, leaving 1.5 to 2 m avenues between rows. The weeds in these avenues are managed in several ways. In this experiment, pineapple was planted in three blocks, 15 to 22 m apart from each other and the impact of three common weed management practices: (T1) clean weeding; (T2) slash weeding; and (T3) mulching with excess coir dust, on the ant/mealybug/spider population and fruit yield was studied in these 3 blocks. As a first step towards the management of the wilt disease, it is important to minimize ant numbers and remove weeds between rows and limit use of coir dust mulch to base of plants along rows.

Sulaiman, S.F.M., Subhadrabandhu, S. (Ed.) & Chairidchai, P. 2000a. Effect of pesticidal pre-treatments of pineapple plants on the incidence of mealybug wilt disease. Acta Horticulturae No. 529: 273-288. [SulaimSuCh2000a] Notes: [Proceedings of the Third International Pineapple Symposium, Pattaya, Thailand, 17-20 November 1998.] The effect of insecticide pretreatments on pineapple cv. Mauritius on the incidence of mealybugs (*Dysmicoccus brevipes*) and attendant ant colonies in pineapple fields located at an intermediate low country (Hunuwila) and at a wet low country (Walpita) in Sri Lanka was investigated. The soil in Hunuwila was red-yellow podzolic of a sandy alluvial nature, while that in Walpita was lateritic. The treatments were: untreated control (T1); pretreatment of pineapple planting material with insecticides usually used by farmers and pretreatment with profenofos. Pitfall traps were used to record ant number. Mealybug numbers on the plants were measured. Data were collected weekly for 2 years. The dominant ant species attending on mealybugs was *Technomyrmex albipes*.

Sunil, J., Ballal, C.R., Rao, N.S. & Joshi, S. 2001. Influence of temperature on biological, predatory and reproductive attributes of *Sticholotis cribellata* Sicard (Coleoptera: Coccinellidae) on *Melanaspis glomerata* Green. Annals of Plant Protection Sciences 9(1): 26-31. [SunilBaRa2001]

Notes: The influence of temperature on the development, survival, fecundity and predatory potential of *Sticholotis cribellata* was studied on *Melanaspis glomerata*. Ability of the predator to multiply faster and survive longer at 26°C can be exploited during early infestation levels of *M. glomerata* when the temperature ranges from 26 to 28°C.

Swiatek, P. 2001. Structure and development of ovaries in the weevil, *Anthonomus pomorum* (Coleoptera, Polyphaga). I. Somatic tissues of the trophic chamber. Folia biologica (Krakow) 49(3-4): 215-224. [Swiate2001]

Notes: N/A

Szymanska, B., Kubrakiewicz, J., Jankowska, W. & Bilinski, S.M. 2001. Structure of ovaries and oogenesis in Corydalidae and Chauliodes (Insecta, Megaloptera). I. Architecture of adult ovarioles and previtellogenesis. Folia biologica (Krakow) 49(1/2): 91-97. [SzymanKuJa2001]

Notes: Unspecified coccids are mentioned as having similar reproduction methods as those described here.

Tabatadze, E.S. & Yasnosh, V.A. 2001 (1999). Population dynamics and biocontrol of the Japanese scale, *Lopholeucaspis japonica* (Cockerell) in Georgia. Entomologica 33(1999): 429-434. [TabataYa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The Japanese scale, *Lopholeucaspis japonica* (Cockerell) was discovered in Georgia in the Batumi Botanical Garden in 1931, where it was probably introduced from Japan. During the 1950's, it was widespread and became a major pest of citrus, other fruits, tea, tung and ornamental plants. Japanese scale differs greatly from many other diaspidid species because it is pupiparial, the adult female being enclosed in a chitinous "puparium" which makes the use of contact pesticides to control this insect difficult. The scale has 2 generations a year (sometimes 3) and development of some stages is prolonged. Recently, the populations of Japanese scale have been significantly reduced due to effective control by its natural enemies, which include some chalcid parasitoids and coccinellid predators, but which is mainly due to an undescribed species of the fungus genus *Aschersonia*, hitherto not found in the Caucasus.

Takagi, S. 2001. Four gall-inducing eriococcids, with notes on dipterocarp-associated gall-inhabiting coccoids (Homoptera: Coccoidea: Eriococcidae and Beesoniidae). Insecta Matsumurana 58: 51-113. [Takagi2001]

Notes: *Gallacoccus secundus*, *G. spinigalla*, *G. heckrothi*, spp. nov. and *Echinogalla pustulata*, gen. et sp. nov., are described. Hosts are given.

Takahashi, E., Marcylo, T. H., Watanabe, T., Nagai, S., Hayatsu, H. & Negishi, T. 2001. Preventive effects of anthraquinone food pigments on the DNA damage induced by carcinogens in *Drosophila*. Mutation Research 480/481: 139-145. [TakahaMaWa2001]

Notes: We have previously demonstrated the inhibitory effect of chlorophyllin, a green food additive, on the genotoxicities of various carcinogens in *Drosophila*. Recently, we reported that purpurin, a component of a red food additive produced from madder root (*Rubia tinctorium*), inhibits the bacterial mutagenicity of heterocyclic amines. In the present study, we examined antigenotoxic activities of various pigments that are either constituents of food or food additives, using *Drosophila* in vivo DNA repair assay. Third instar larvae of *Drosophila* were fed a mutagen with or without pigment. The resulting adult flies were monitored for their male (repair deficient)/female (repair proficient) ratios, which reflect the DNA damage. We tested a total of 20 pigments, which are mainly of plant origins, including flavonoids, carotenoids, anthocyanins, anthraquinones and beta-diketone (curcumin)-derivatives, against the genotoxicities of eight carcinogens; IQ, MeIQx, AFB1, NDMA, 2-AAF, DMBA, 4NQO, and MNU. Four anthraquinone pigments (alizarin, purpurin, lac color, and cochineal extract) showed significant antigenotoxic activities.

Tambasco, F.J., Sa L.A.N. de, Nardo E.A.B. de, Tavares, M.T. & de Nardo, E.A.B. 2000. [The pink mealybug, *Maconellicoccus hirsutus* (Green): an imported pest now of quarantinable importance encountered in British Guiana (Guyana)] (In Portuguese). Seminario de atualidades em protecao florestal: incenios, pragas e doenças 30(1-2): 85-93. [TambasSaTa2000]

Notes: [Original title: Cochonilha rosada, *Maconellicoccus hirsutus* (Green): uma praga de importancia quarentenaria ja se encontra na guiana inglesa.] Information is presented on the characteristics and control of this pest, which attacks a wide variety of woody plants, and originates from the Caribbean region. Preventative methods for reducing the risk of accidental entry into Brazil are discussed.

Tang, F.T. 2000. [Neomargarodes (Coccoidea: Margarodidae) and a new species reported from China.] (In Chinese; Summary In English). Wuyi Science Journal 16: 1-5. [Tang2000]

Notes: Description and illustration of *Neomargarodes chondrillae*, *N. cucurbitae*, new species, and review of *N. niger*. Key to species recorded in China and its neighboring countries provided.

Tang, F.T. 2000a. [Studies on cochineal scales *Porphyrophora* (Homoptera: Coccoidea, Margarodidae).] (In Chinese; Summary In English). Wuyi Science Journal 16: 7-13. [Tang2000a]

Notes: The three species found in China are *Porphyrophora polonica* on the roots of *Caragana* and *Agropyron* spp., *P. ussuriensis* on roots of *Cleistogene* sp. and *P. sophorae* on roots of *Sophora* sp., *Glycyrrhiza uralensis*, *Hedysarum scoparium* and *Sophora* sp.

Tang, F.T. 2001. [Review and supplement of Professor Wu's "Catalogue Insectorum Sinensium" (Family Coccidae).] (In Chinese; Summary In English). Journal of Shanxi Agricultural University 21(2): 1-5. [Tang2001]

Notes: The history of Coccoid fauna study in China may be divided into three stages. The early stage began in the year 1848 with the description of *Ericerus peta* and lasted until 1935 with a publication by the late Prof. Wu Chenfu of Yencheng University of China which included 165 species belonging to 47 genera and 7 subfamilies. This paper reviews that early work in light of recent knowledge and claims 152 real species recorded with 168 omitted, belonging to 120 genera and 11 families in accordance with recent taxonomy.

Tawfik, M.H. & Ghabbour, M.W. 2001 (1999). Monitoring California red scale and its aphelinid parasitoid using yellow sticky traps. Entomologica 33(1999): 267-272. [TawfikGh2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Yellow sticky traps, which had been erected to monitor the dispersal of the sweet-potato whitefly, *Bemisia tabaci* Gennadius, from cotton fields to citrus orchards in Texas, also attracted adult male *Aonidiella aurantii* (Maskell) and its parasitoid *Aphytis* sp. Populations in three citrus orchards representing different host-plant varieties and maturity were studied and the effect of these and some environmental parameters on the numbers of male *A. aurantii* and of its parasitoid caught on the traps are described.

Taylor, S.L. & Hefle, S.L. 2001. Ingredient and labeling issues associated with allergenic foods. *Allergy* 56(Suppl. 67): 64-69. [TaylorHe2001]

Notes: Cochineal extract is listed as one of the food ingredients capable of eliciting allergic sensitization, although it would rarely be classified as allergenic.

Thao, M.L., Wineriter, S., Buckingham, G. & Baumann, P. 2001. Genetic characterization of a putative densovirus from the mealybug *Planococcus citri*. *Current Microbiology* 43: 457-458. [ThaoWiBu2001]

Notes: Total genomic DNA preparations from the citrus mealybug, *Planococcus citri*, contained DNA band corresponding to 5.5 kilobases. This DNA was a linear molecule and was cloned into pUC18. Nucleotide sequence determination indicated that it was the replicative form of a densovirus, most closely related to the virus from *Periplaneta fuliginosa* (smokybrown cockroach).

The Golden Bug: The Story of the Red Cochineal 2000. Century High School, Alhambra, California. 50 pp. [GoldenBuSt2000]

Notes: The result of a high school class project, it covers uses of cochineal (*Dactylopius coccus*), history of the cochineal trade, brief taxonomic and biological notes and works of fiction inspired by the project. Supervised by Michelle Leddel, teacher.

Thirumurugan, A. & Gautam, R.D. 2001. Relative toxicity of some insecticides to mealy bug, *Planococcus pacificus* (Pseudococcidae, Hemiptera). *Annals of Plant Protection Sciences* 9(1): 135-136. [ThirumGa2001]

Notes: Nymphs and adults of *Planococcus pacificus* were sprayed with a series of concentrations of insecticides: chlorpyrifos and monocrotophos at 0.0009, 0.001, 0.005, 0.007 and 0.09%, phosalone at 0.009-0.03%, and endosulfan at 0.5-1.75%. The LC50 values for the insecticides were determined and the relative resistance of the mealybug to various insecticides in relation to its predatory bug (*Scymnus brunnescens*) was calculated by taking the ratio of respective LC50 values. The predators were more resistant to endosulfan than mealybugs.

Tian, M.Y. 2000. [Two new species of Cybocephalidae (Coleoptera) from Northwest China.] (In Chinese; Summary In English). *Entomologia Sinica* 7(2): 127-131. [Tian2000]

Notes: Two new species of *Cybocephalus* Erichson (Coleoptera: Cybocephalidae), *C. aksuensis* sp. nov. from Xinjiang, a predator of Diaspididae, and *C. kuangi* sp. nov. from Gansu, China, are described as new to science.

Tremblay, E. & Ponzi, R. 2001 (1999). Ultrastructural observations on symbiont degeneration in the male line of *Pseudaulacaspis pentagona* Targioni Tozzetti) (Hemiptera: Coccoidea: Diaspididae). *Entomologica* 33(1999): 157-163. [TremblPo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] During the development of the immature stages of male scale insects, the mouthparts become lost at the prepupal stage and this is paralleled by the degeneration of the symbiont microorganisms inhabiting the mycetocytes. This degenerative process has been studied in the male line of the white peach scale, *Pseudaulacaspis pentagona* (Targioni Tozzetti). In the first two feeding instars, the mycetocytes appear as spherical cells, 30-40 μ m in diameter, filled with normal microorganisms, round or oval in shape, 3-5 μ m long. In the prepupal and pupal stages, some symbionts undergo degeneration by dissolution of the dense ribosomal granulations which characterize the microorganisms in the two feeding instars. In these symbionts, the fusing of the small vacuoles results in the appearance of larger, more centrally placed, vacuoles. Other symbionts become loosely reticulated or, alternatively, condensed or contracted, to form regular or irregular bodies. The mycetocytes seem to undergo no reduction in size but their cytoplasm shows signs of dissolution as well. A great number of dense, crystalline-like granulations were found in their proximity. The nature and derivation of these granulations remains to be investigated.

Trueman, H.E. 2001 (1999). Phylogeny of the Margarodidae (Hemiptera: Coccoidea) using molecular sequences. *Entomologica* 33(1999): 168. [Truem2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. In the past, the taxonomy of the Margarodidae has been based solely on morphological features, mainly those of adult females. However, the reduction and loss of structures makes it difficult for evolutionary relationships to be estimated from morphology alone. Morrison (1927) characterised the margarodids by their possession of abdominal spiracles in all stages and compound eyes in the adult males, two features that are clearly not shared derived features (synapomorphies) (Miller, 1984). The characters upon which the family is based are ancestral features (plesiomorphies) that margarodids share with other hemipterans. Thus, the Margarodidae may be a paraphyletic grouping of species that could not be placed in other families (Schlee, 1969), rather than a monophyletic group. A re-construction of margarodid phylogeny using molecular sequences and cladistic methodology was presented, addressing the question of monophyly.

Tumminelli, R., Amico, C., Conti, F., Fisicaro, R., Saraceno-F. & Mazzone, A. 2001. [Results of four years of experiments: management of red scale in citrus fruit.] Resultati di quattro anni di sperimentazione: gestione della cocciniglia rossa forte degli agrumi. (In Italian). Informatore Agrario 57(19): 31-36. [TumminAmCo2001]

Notes: Red scale (*Aonidiella aurantii*) is one of the most important pests of citrus fruits in Sicily, Italy. It was first recorded in 1966 and is mainly present in hotter areas (further from the coast). Traditionally, *A. aurantii* is controlled in the summer by pre-harvest application of synthetic insecticides or post-harvest application of mineral oils. However, traditional control methods are known to produce undesirable phytotoxic effects, increase susceptibility to frost, and significantly reduced yields. New monitoring techniques have become available recently, based on the use of pheromone traps. As an alternative to the use of chemicals, the use of the natural enemy *Aphytis melinus* is discussed. The timing of commercially reared *A. melinus* release, thought to be best in spring, is calculated with the help of pheromone traps which indicate the presence of virgin females of *A. aurantii* (preferred by *A. melinus*). The efficacy of *A. melinus* was tested during 1995-98 in plantations of 20- to 30-year-old Valencia, Tarocco, Moro and Sanguinella oranges and Star Ruby grapefruits. The efficacy and selectivity were also investigated by single and combined applications of imidacloprid, buprofezin, mineral oils and chlorpyrifos-ethyl on 2- and 3-year-old Lunario lemons, Tarocco and Valencia oranges, and Marisol clementines. Data are presented on nontarget effects on *Cales noacki*, *Metaphycus* sp., *A. melinus*, *Coccinella septempunctata*, *Adalia bipunctata*, *Scymnus* spp., *Chilocorus bipustulatus*, *Exochomus quadripustulatus* and *Rodolia cardinalis*.

Ülgentürk, S. & Toros, S. 2001 (1999). Faunistic studies on the Coccidae on ornamental plants in Ankara, Turkey. Entomologica 33: 213-217. [UlgentTo2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] The coccid species present in parks, gardens and greenhouses in Ankara, Turkey, and their host plants were studied in 1992, '94, '95 and '96. Thirteen species of Coccidae were detected on ornamental plants: two species of *Eulecanium*, four species of *Parthenolecanium* and one species each from the genera *Coccus*, *Filippia*, *Palaeolecanium*, *Physokermes*, *Pulvinaria*, *Saissetia* and *Sphaerolecanium*. The most common species was *Parthenolecanium corni*, found on 36% of the infested ornamental plants. *Physokermes picea* was found on four species of *Picea*, of which it infested 16.3% of the plants surveyed. *Filippia follicularis* was detected on 2% of *Fraxinus* spp. while *Physokermes piceae*, *Filippia follicularis*, *Parthenolecanium persicae* and *P. pomeranicum* were recovered on 16, 2, 1 and 1% of the infested plants respectively.

Ülgentürk, S. & Toros, S. 2001a (1999). Natural enemies of the oak scale insect, *Eulecanium ciliatum* (Douglas) (Hemiptera: Coccidae) in Turkey. Entomologica 33: 219-224. [UlgentTo2001a]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Eulecanium ciliatum* Douglas is an important pest of ornamental plants in the Palaearctic region and has a wide range of natural enemies. In Ankara, Turkey, eight hymenopterous parasitoids and one hyperparasitoid species have been bred from this scale, and nine predators were collected in association with it, seven Coleoptera and two Hemiptera.

Ülgentürk, S. & Toros, S. 2001b (1999). Studies on the biology of *Eulecanium ciliatum* (Douglas) (Hemiptera: Coccidae) in Ankara, Turkey. Entomologica 33(1999): 351-356. [UlgentTo2001b]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Eulecanium ciliatum* Douglas is a common pest species on Aceraceae and Rosaceae in Ankara province, Turkey. Its biology was investigated on *Acer campestre*, *A. pseudoplatanus*, *Crataegus monogyna* and *C. oxyacantha* in 1995-1996. *E. ciliatum* had one generation a year and overwintered as the 2nd-instar nymph. The number of eggs laid per female depended on the host, with the greatest number of eggs being laid on *A. pseudoplatanus*, on which it had the densest populations. The 1st-instar nymphs were found on both leaf surfaces but they preferred the upper surface. The 2nd-instar nymphs preferred sites on branches on the north-east side of the host trees. The sex ratio varied between 1.5 and 3.8:1.

Unwin, D. 2001. A key to the families of British bugs (Insecta, Hemiptera). Field Studies 10(1): 1-35. [Unwin2001]
Notes: This illustrated dichotomous key is not intended for experts, who have no need for it, and is limited in scope to what can be achieved by examining unprepared specimens through a stereo dissecting microscope of moderate power (up to x50). Nevertheless, the user will be able to identify the adults of most British bugs to family level; but there are two groups, aphids (Aphidoidea) and scale insects (Coccoidea) where more sophisticated techniques, beyond the scope of this guide, will have to be used.

Uygun, N., Öncüer, C., Karaca, I., Yoldas, Z. & Sengonca, C. 2001 (1999). An annotated list of the natural enemies of the scale insects (Hemiptera: Coccoidea) of Turkey. Entomologica 33(1999): 231. [UygunOnKa2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Abstract only. A list of the known natural enemies collected from the Coccoidea of Turkey was presented, based on the authors' collection data and from bibliographical sources. This includes 70 species belonging to 7 orders and 17 families. The most numerous family of predators is the Coccinellidae (Coleoptera) with 30 species, while the most numerous hymenopteran parasitoid families are the Aphelinidae with 21 species and the Encyrtidae with 12 species. The remaining orders include the Acarina, Thysanoptera, Heteroptera, neuroptera, Diptera and Lepidoptera, which have between 1 and =5 species each. Some of these natural enemies are considered to be effective in decreasing the scale populations. For instance, in our citrus ecosystem, 18 species of natural enemies are known for *Aonidiella aurantii* (Maskell). Other Diaspididae, from a variety of ecosystems, are particularly parasitised by several *Aphytis* spp. Twenty-five species of native natural enemies give good control of *Planococcus citri* Risso, while *Rodolia cardinalis* (Mulsant) completely controls *Icerya purchasi* Maskell. Seven new records of biocontrol agents in Turkey were discussed.

Vahedi, H.A. 2001 (1999). The biology of *Porphyrophora tritici* (Hemiptera: Coccoidea: Margarodidae) and the effect of some farming practices on its populations in Kermanshah, Iran. Entomologica 33(1999): 357-363. [Vahedi2001]
Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] This paper describes the life cycle of *Porphyrophora tritici* Bodenheimer on wheat in the Kermanshah region of Iran, and the effect of various farming practices (irrigation, harvesting, rotations and time of ploughing) on its survival. It is concluded that the manipulation of the time of ploughing may be the most economical management method of those tried.

van den Berg, M. 2000. [Influence of high rainfall on pests.] Plae gedurende nat seisoene. (In Afrikaans; Summary In English). Neltropika Bulletin No. 309: 15-17. [vanden2000]

Notes: During years when the seasonal rainfall in South Africa is significantly higher than the long term average, an increase in new growth in fruit trees and an earlier and larger fruit set can be expected. Also expected is an increase in the numbers of the citrus psylla [*Diaphorina citri*] and the damage caused by nematodes. Since the parasitoids of armoured scale insects [Diaspididae] provide biological control earlier in the season, the armoured scales are generally less of a problem. There is usually also a decrease in damage by thrips [Thripidae], while ants [Formicidae] and termites [*Isoptera*] are less abundant. A decrease in the damage by butterfly and moth [Lepidoptera] and beetle [Coleoptera] pests can also be expected.

Van der Merwe, F. 2000. [Is mealybug on pome fruit under control? (1.) Pest status.] Is witluis op kernvrugte nog onder beheer? (1.) Plaagstatus. (In Afrikaans; Summary In English). Deciduous Fruit Grower 50(4): S1-S6. [Vander2000]

Notes: Disease control and the resistance to chemicals of Pseudococcidae are discussed here.

van Veller Marco, G.P., Kornet, D.J. & Zandee, M. 2000. Methods in vicariance biogeography: Assessment of the implementations of assumptions 0, 1, and 2. Cladistics 16(3): 319-345. [vanVelKoZa2000]

Notes: As we have argued previously, for the valid derivation of general area cladograms in vicariance biogeography, two requirements should be met. First, sets of area cladograms derived under assumptions 0, 1 and 2 should be inclusive (requirement I). Second, general area cladograms should be based on area cladograms, for different monophyletic groups, derived under the same assumption (requirement II). We now assess for their actual implementation of assumptions A0, A1, and A2 and for the extent to which they meet requirements I and II, the following methods (and correlated computer programs): Component Compatibility Analysis (CAFCA), Brooks Parsimony Analysis (PAUP), Component Analysis (Component 1.5), Reconciled Tree Analysis (Component 2.0), and Three Area Statement Analysis (TAS). For this purpose we use empirical (*Heterandria*, *Xiphophorus*, *Cyttaria*, *Eriococcus/Madarococcus*) and theoretical data sets. All programs appear to violate, to a different degree, requirement I (deriving inclusive sets of area cladograms under assumptions) when dealing with sympatric taxa under A1 or A2. Dealing with sympatric taxa a posteriori only prevents this violation. All programs examined appear to meet requirement II (deriving general area cladograms under a single assumption).

Villacarlos, L.T. 2000. Two *Neozygites* species (Zygomycetes: entomophthorales) infecting aphids and mealybugs on Leyte Island [Philippines]. Philippine Entomologist 14(1): 31-36. [Villac2000]

Notes: The presence of two species of *Neozygites* (Zygomycetes: Entomophthorales) in the Philippines is documented. Epizootics due to *Neozygites fresenii* (Nowakowski) Remau diere and Keller were observed on *Aphis craccivora* Koch populations on *Gliricidia sepium* (Jacq.) Steud. and string beans, *Vigna sesquipedalis* Fruw., and on *A. citricola* van de Goot infesting *Mikania cordata*, both in 1994, in Visca, Baybay, Leyte. Also in 1994, epizootics due to *N. fumosa* (Speare) Remaudiere and Keller were also observed on the mealybug, *Coccido'hystrix insolita* (Green) infesting eggplant (*Solanum melongena* L.) in Inopakan and later on unidentified mealybugs on *Sida rhombifolia* L. Epizootics of both *N. fresenii* and *N. fumosa* resulted to drastic reduction in the aphid and mealybug populations. Enhancing the occurrence of these fungi may have potential in the biological control of these pests.

Vogelgesang, M. & Szklarzewicz, T. 2001. Formation and structure of egg capsules in scale insects (Hemiptera, Coccoidea) - I. Ortheziidae. Arthropod Structure & Development 30(1): 63-68. [VogelgSz2001]

Notes: The paired ovaries of the investigated species are composed of 20-30 ovarioles of a telotrophic-meroistic type. Each ovariole is subdivided into an apical tropharium (= trophic chamber) and a vitellarium that contains a single developing oocyte. This oocyte is surrounded by a mono-layered follicular epithelium that is responsible for synthesis of precursors of egg envelopes. In *Orthezia*, synthesis and secretion of precursors of egg envelopes (= choriogenesis) and accumulation of reserve substances in the oocyte cytoplasm (= vitellogenesis) start at the same time. The egg capsule is composed of two envelopes: an internal, thick vitelline envelope and an external, very thin chorion. The egg surface is covered with numerous, irregularly arranged waxy filaments of spiral shape. Eggs are devoid of the micropylar, aeropylar and hydropylar openings.

von Dohlen, C.D., Kohler, S., Allsop, S.T. & McManus, W.R. 2001. Mealybug β -proteobacterial endosymbionts contain γ -proteobacterial symbionts. Nature. London 412: 433-436. [vonDohKoAl2001]

Notes: Some insects have cultivated intimate relationships with mutualistic bacteria since their early evolutionary history. Most ancient 'primary' endosymbionts live within the cytoplasm of large, polyploid host cells of specialized organ (bacteriome). Within their large, ovoid bacteriomes, mealybugs (Pseudococcidae) package the intracellular endosymbionts into 'mucus-filled spheres, which surround the host cell nucleus and occupy most of the cytoplasm. The genesis of symbiotic spheres has not been determined, and they are structurally unlike eukaryotic cell vesicles. Recent molecular phylogenetic and fluorescent *in situ* hybridization (FISH) studies suggested that two unrelated bacterial species may share individual host cells, and that bacteria within spheres comprise these two species. Here we show that

mealybug host cells do indeed harbour both β - and γ -subdivision Proteobacteria, but they are not co-inhabitants of the spheres. Rather, we show that the symbiotic spheres themselves are β -Proteobacteria. This is the first report, to our knowledge, of an intracellular symbiosis involving two species of bacteria.

Wakgari, W. & Giliomee, J. 2001. Effects of some conventional insecticides and insect growth regulators on different phenological stages of the white wax scale, *Ceroplastes destructor* Newstead (Hemiptera : Coccidae), and its primary parasitoid, *Aprostocetus ceroplas*. International Journal of Pest Management 47(3): 179-184. [WakgarGi2001]
Notes: The toxicity of two juvenile hormone analogues, pyriproxyfen (Nemesis (R)) and fenoxy carb (Insegar (R)), and two contact insecticides, methomyl (Lannate) and methdathion (Ultracide), was evaluated against immature stages (LI, LII, LIII) of *Ceroplastes destructor* Newstead in the field. The effects of these chemicals and one moulting inhibitor, triflumuron (Alsystin (R)), and three insecticides: methyl-parathion (Penncap-M), profenofos (Selecron) and prothifofos (Tokuthion), on *Aprostocetus (= Tetrastichus) ceroplastae* (Girault) were assessed in the laboratory. Development of the first and second instar nymphs of *C. destructor* was completely arrested by the chemicals. Less than 1% of scales sprayed with pyriproxyfen at LII stage survived to adult female. Survival to the adult stage varied significantly between chemical treatments, and between chemicals and untreated controls for scales sprayed at the LIII stage. Female fecundity, fertility and body sizes of survivors of treatments applied at the LIII stage were not significantly affected by any of the chemicals. All the chemicals exhibited high toxicity to *A. ceroplastae*. Only triflumuron was slightly harmful, while methomyl was the most toxic (harmful), causing 100% mortality in the first 30 min after treatment. Although all the chemicals evaluated had effectively arrested the first and second instars of *C. destructor*, none of them exhibited sufficient selectivity to *A. ceroplastae* to warrant recommendation for integrated management of *C. destructor* in citrus orchards in South Africa, where *A. ceroplastae* plays an important role.

Wakgari, W.M. 2001. The current status of the biocontrol of *Ceroplastes destructor* Newstead (Hemiptera : Coccidae) on Citrus and *Syzygium* in South Africa. Biocontrol Science and Technology 11(3): 339-352. [Wakgar2001]
Notes: The incidence of parasitism and predation of the third instar and adult *Ceroplastes destructor* Newstead (Hemiptera: Coccidae) on *Citrus reticulata* (Blanco) and *Syzygium (=Eugenia) malaccensis* (L.) in the Western Cape, South Africa, was assessed from June 1997 to December 1999. Seven primary and three secondary parasitoids, as well as four predator species were identified. *Aprostocetus (=Tetrastichus) ceroplastae* (Girault) was the predominant parasitoid species accounting for 78.9% of the total primary parasitoids. Peak numbers of parasitoids and predators were synchronized with peak emergence of the scale stages susceptible to parasitism and predation, indicating that the scale-parasitoid/predator association contained a density-dependent regulatory mechanism. Parasitoids demonstrated density-dependence at the third instar and pre-ovipositing female stage for scales on *C. reticulata* and *S. malaccensis*, respectively whereas predators acted as a density-dependent mortality factor only during the pre-ovipositing female stage of scales *C. reticulata*. However, the density-dependent process of parasitism and predation fluctuated between generations, indicating that the regulatory effects of these mortality agents may not be strong enough to provide long-term suppression of scales under the current citricultural practices. Mortality due to disease was either inversely related or not related to scale density. Body-length of *A. ceroplastae* varied significantly between sampling periods, parasitoid sex and scale stage from which it was reared ($P < 0.001$). The sex ratio of *A. ceroplastae* reared from early third instar *C. destructor* was male biased while that of parasitoids reared from mature adult female was slightly female biased.

Wakgari, W.M. & Giliomee, J.H. 2000. Fecundity, fertility and phenology of white wax scale, *Ceroplastes destructor* Newstead (Hemiptera: Coccidae), on *Citrus* and *Syzygium* in South. African Entomology 8(2): 233-242. [WakgarGi2000]

Notes: The population density of *Ceroplastes destructor* Newstead has increased steadily since 1994, particularly on *Citrus reticulata* (Blanco), in citrus-growing areas of the Western and Eastern Cape Provinces of South Africa. The fecundity, body size and phenology of *C. destructor* were studied to provide a more informed basis for control programmes. No significant differences in fecundity were found between orchards ($P > 0.05$). However, fecundity varied significantly between female size-classes from the same orchard ($P < 0.001$). Female body-size differed significantly between orchards ($P < 0.05$) and was significantly positively correlated with fecundity both in 1997 and 1998. Different size-groups had varying oviposition periods, larger individuals having a longer oviposition period. No differences in egg fertility were found between orchards ($P > 0.05$). *Ceroplastes destructor* had one generation per year

in the Western Cape Province, South Africa. Oviposition commences in mid November and continues until the end of December, with a few females ovipositing until mid January. The decline in population density of the second instar in February was followed by a steady increase in that of the third instar. The third instar stage extended to the end of July followed by a peak population of adults in August.

Wakgari, W.M. & Giliomee, J.H. 2001a. Population dynamics of the white wax scale, *Ceroplastes destructor* (Hemiptera : Coccidae), on citrus in South Africa, with implications for biological control. Bulletin of Entomological Research 91(4): 307-315. [WakgarGi2001a]

Notes: The population dynamics of the white wax scale, *Ceroplastes destructor* Newstead, was studied intensively in four easy-peel citrus orchards in the Western Cape Province of South Africa over three consecutive years (1997-1999). Key factor analysis was used to determine and quantify the contribution of individual mortality factors to the total generation mortality. Key stage mortality, determined from a cohort life table, was in the third instar and pre-ovipositing female stages. Mortality of *C. destructor* was caused primarily by parasitoids, predators and miscellaneous factors. Parasitoids and miscellaneous factors acted as density-dependent regulatory agents during the pre-ovipositional and first instar stages respectively. This has implications for biological control of *C. destructor*. Some of the mortality factors acted either randomly with no reference to the population densities or in an inverse density-dependent manner during the egg-crawler, second or third instar stages.

Wakgari, W.M. & Giliomee, J.H. 2001b (1999). Fecundity, size and dispersal of the white wax scale, *Ceroplastes destructor* Newstead (Hemiptera: Coccidae) in the western Cape Province of South Africa. Entomologica 33: 365-375. [WakgarGi2001b]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Ceroplastes destructor* Newstead has recently attained pest status in areas of South Africa where citrus is grown, particularly on *Citrus reticulata* in the Western Cape Province. The fecundity, fertility and dispersal of *C. destructor* were studied as part of a comprehensive overview of its morphology, biology and population dynamics, with the aim of providing a more informed basis for control programs. Fecundity varied significantly both between orchards ($P<0.01$) and between individual females from the same orchard ($P<0.001$). Female body-size also differed between orchards ($P<0.05$) and was positively correlated with fecundity ($r^2=0.84$). The oviposition period was longer for large individuals. No differences in fertility were found between orchards ($P>0.05$). Dispersal was by 1st-instar nymphs, mainly on air-currents, and the numbers caught on a series of sticky traps up to 4m from the source were very similar, suggesting that wind dispersal was very efficient. The numbers caught appeared to be positively correlated to the initial population. The population of 2nd-instar nymphs on the seedlings after 6 weeks was smaller after an initially heavy infestation than on those initially more lightly infested.

Wale, M. 2000. Mealy bugs devastate stored potatoes in Adet area. AgriTopia 15: 2-4, 6, 9-10. [Wale2000]

Notes: The level of damage caused by mealybugs [Pseudococcidae] on potato is steadily increasing in Adet area. As storage time increases mealybugs increase in large numbers, feeding on the tuber contents by sucking with their stylets and causing the tuber to shrink. The nymphs and adults form colonies mostly at the bases of the sprouts and on the eyes of the tuber. The insect produces a cotton-like mass that covers the tuber and eventually the tuber rots. The level of mealybug infestation varied greatly with the cultivar in storage, with some showing no sign of damage and others being completely damaged.

Walton, V.M. & Pringle, K.L. 2001. Effects of pesticides and fungicides used on grapevines on the mealybug predatory beetle *Nephus 'boschianus'* (Coccinellidae, Scymnini). South African Journal of Enology and Viticulture 22(2): 107-110. [WaltonPr2001]

Notes: *Planococcus* sp. is the host species for this predator.

Wang, H.X., Li, W.D., Chen, G.Q. & Gong, J.Q. 2000. [Study on the chemical control of arbutus oyster scale.] (In Chinese). South China Fruits 29(4): 31-32. [WangLiCh2000]

Notes: The arbutus oyster scale [Diaspididae] usually attacks the 2-year-old branches and main stem of arbutus trees (*Myrica rubra* Sieb. et Zucc.), weakening the trees, reducing production and even killing them. Treatment with 40%

Suprocide [of unstated composition], 25% buprofezin, 40% omethoate, 40% Optunal [1-methylethyl 2-[(aminomethoxyphosphinothioly)oxy]benzoate], 45% malathion and various combinations of these were tested against the pest. Results showed the best results were obtained by spraying with a mixed solution of 2000 x solution of 40% Suprocide emulsion or 40% omethoate + 1500 x solution of 25% buprofezin powder.

Wang, T.C. 2001. (In Chinese). In: , Fauna Sinica (Insecta Vol. 22: Coccoidea: Pseudococcidae, Eriococcidae, Coccidae, Asterolecaniidae, Lecanodiaspididae, Cerococcidae, Aclerdidae) Science Press, Beijing. 610 pp. [Wang2001]
Notes: [Supported by the National Natural Science Foundation of China]. 330 species reviewed.

Watanabe, M.A., Tambasco, F.J., Costa, V.A., Nardo, E.A.B. de, Facanali, R. & de Nardo, E.A.B. 2000. [Population dynamics of some armored scales in citrus trees in different Sao Paulo State localities, Brazil.] Flutuaçao populacional de cochonilhas de carapaca na cultura de citros em municipios paulistas. (In Portuguese; Summary In English). Laranja 21(1): 49-64. [WatanaTaCo2000]

Notes: Species identified in infested leaves were sampled fortnightly or monthly, depending on the locality, in Sao Paulo State, Brazil in 1997. The species found were: *Selenaspis articulatus* (dominant in all orchards), *Parlatoria ziziphi*, *Mycetaspis personata*, *Cornuaspis beckii* and *Chrysomphalus ficus* [*Chrysomphalus aonidum*]. Rates of parasitism and mortality were evaluated for *S. articulatus*. Populations of *S. articulatus* remained above the economic damage level (10 scales/leaf) during most months of the year, and in most localities.

Watanabe, M.A., Tambasco, F.J., Nardo, E.A.B. de, Viana, R.I. & Pereira, G.D. 2000. [Competition between *Selenaspis articulatus* and *Parlatoria ziziphi* scales in orchards in the Citrus region of Sao Paulo State.] (In Portuguese; Summary In English). Laranja 21(1) 81-97. [WatanaTaNa2000]

Notes: [Original title: Competição entre as cochonilhas *Selenaspis articulatus* e *Parlatoria ziziphi* em pomares da regiao citrica paulista.] A study was carried out in 1996 in 26 Citrus orchards to investigate if rufous scale (*Selenaspis articulatus*) and black scale (*Parlatoria ziziphi*) scales competed for the ecological niche represented by Citrus leaves. Possible relationships between occurrence and climatic factors were also investigated. *S. articulatus* was the dominant species during most of the year. *P. ziziphi* was less affected by climatic factors, whereas high temperature and humidity were more favourable to *S. articulatus*.

Wi, A.J. & Park, S.C. 2001. [Biological and meteorological factors affecting the responsiveness of *Matsucoccus thunbergianae* males to synthetic pheromone.] (In Korean). Journal of Korean Forestry Society 90(1): 139-145. [WiPa2001]

Notes: Behavior of *Matsucoccus thunbergianae* Miller and Park males immediately after emergence from their cocooning site, and meteorological factors affecting the responsiveness of the flying males to synthetic pheromone were studied. On *Pinus thunbergii* saplings, newly emerged males walked around to locate females. The males launched themselves into flight after up to three times of copulation. Without the presence of females, the males took off within five minutes whereas when the females were placed nearby but copulation was artificially prohibited the males did not take off. In a wind tunnel, the presence of female pheromone discouraged male take off. More males were flying in sunny area than in shade, but light intensity had no effect on the responsiveness of males toward the pheromone source. Wind speed was the main meteorological factor that affected the male responsiveness. Most males, after hitting the substrate near the pheromone source with various posture, stood on their feet and approached the source.

Wiggins, G.J., Grant, J.F. & Welbourn, W.C. 2001. *Allothrombium mitchelli* (Acari : Trombidiidae) in the Great Smoky Mountains National Park: Incidence, seasonality, and predation on beech scale (Homoptera : Eriococcidae). Annals of the Entomological Society of America 94(6): 896-901. [WigginGrWe2001]

Notes: American beech gaps in the southern Appalachian mountains are currently threatened by an insect-mediated disease complex known as beech bark disease. *Cryptococcus fagisuga* Lindinger, or beech scale, a major component of beech bark disease, wounds trees through feeding on vascular tissue through the outer cambium. This feeding method leaves numerous wounds and provides entryways for infection by fungal pathogens. *Allothrombium mitchelli* Davis, a large red velvet mite, was found in the Great Smoky Mountains National Park, where it was observed to feed on beech scale. First-instar larvae of *A. mitchelli* are quiescent, and deutonymphs are the only mobile immature stage, *A. mitchelli*

probably has one generation per year with adult population peaks in late spring and early fall; deutonymph populations also peaked in early fall within the areas studied. Both adults and deutonymphs feed on beech scale. Although their status as a biological control agent of beech scale is uncertain, *A. mitchelli* is one of only a few species that has been observed to feed consistently on beech scale.

Williams, D.J. 2001. Description of a new mealybug species of the hypogaeic genus *Rhizoecus* Künckel d'Herculeais, from Chiang Mai province, Thailand (Hemiptera, Pseudococcidae). (In English; Summary In French). Revue Française d'Entomologie 23(1): 15-18. [Willia2001]

Notes: *Rhizoecus loicmatilei* described and illustrated. Recorded on soil sample; no host mentioned. Compared to *R. hibisci* and *R. saintpauliae*.

Williams, D.J. 2001a. African species of the mealybug genus *Antonina* Signoret (Hemiptera: Coccoidea Pseudococcidae). Journal of Natural History 35: 833-848. [Willia2001a]

Notes: Four species of the legless mealybug *Antonina* have been recorded from Africa and are discussed here. These are *A. graminis*, *A. indica* var. *panica*, *A. natalensis*, and *A. transvaalensis*. All are grass-feeding species and live mainly at the base of the plants, between the leaf sheafs or at the base of the roots. The names *A. indica* var. *panica* and *A. transvaalensis* have been synonymized previously with *A. natalensis* but the three species are regarded here as distinct. *A. indica* var. *panica* is here raised to specific rank as *A. panica*. *A. graminis* is known worldwide, *A. panica* occurs in North Africa and extends into Israel and possibly Jordan and *A. natalensis* and *A. transvaalensis* are known from the Afrotropical region. All four species are redescribed and illustrated and a key is provided to aid identification.

Williams, D.J. 2002. Scale insects (Hemiptera: Coccoidea) described by James Anderson M.D. of Madras. Journal of Natural History 36: 237-246. [Willia2002]

Notes: In a series of 14 letters to Sir Joseph Banks published in 1787 and 1788, James Anderson described the scale insect genus *Chloeoon* as new and eight new species of scale insects, all from India. these are *Chloeoon choromandelensis*, *Coccus diacopeis*, *C. erion*, *C. koleos*, *C. microogenes*, *C. narcodes*, *C. oogenes* and *C. trichodes*. The descriptions were spread among the letters and it was not until the 13th and 14th letters were published that most of the species were named. Although the true identity of the species may never be known, they are discussed here and all are regarded as being mealybugs of the family Pseudococcidae. The name *Porphyrophora airae* (Anderson), proposed for a species in the family Margarodidae, is invalid and the species should be known as *P. indica* (Green).

Williams, D.J. & Moghaddam, M. 2000 (1999). Mealybug species of the genus *Planococcus* Ferris in Iran (Homoptera: Coccoidea: Pseudococcidae) with a discussion of *Planococcus vovae* (Nasonov). (In English; Summary In Farsi). Journal of Entomological Society of Iran 18(1/2): 32-43. [WilliaMo2000]

Notes: *Planococcus citri*, *P. ficus* and *P. vovae* from Iran are reviewed. Some characters of *P. vovae*, as represented in the species in Iran, differ from those in most specimens found elsewhere and are discussed as well. The species causes damage to species of Cupressaceae in Iran. A key to species of *Planococcus* in Iran is provided to further aid identification.

Williams, D.J., Martinez Rivero, M.A. & Suris Campo, M. 2001. Mealybugs on sugarcane in Cuba with a discussion of a new record for the New World (Hem., Pseudococcidae). Entomologist's Monthly Magazine 137: 73-76. [WilliaMaSu2001]

Notes: Three species of mealybugs, *Dysmicoccus boninsis* (Kuwana), *Saccharicoccus sacchari* (Cockerell) and *Trionymus radicicola* (Morrison), are known to attack sugarcane in Cuba. They were discussed in a work on the mealybugs of Central and South America by Williams and Granara de Willink (1992) in which references and synonymy to these species are given. A fourth species, *Kiritschenkella sacchari* (Green), has now been found on sugarcane in Cuba. This mealybug has a wide distribution in Asia and the Middle East on various grasses including sugarcane and it may have been accidentally introduced to Cuba on plant material in recent years. The record from Cuba is also the first for the New World. Williams and Granara de Willink (1992) reported the polyphagous species *Dysmicoccus brevipes* (Cockerell) on sugarcane from other islands in the Caribbean area and from South America but so far it has not been found on sugarcane in Cuba although it is present there on other plants.

Williams, D.J., Matile-Ferrero, D. & Martin, J.H. 2001. The mealybug *Planococcus lilacinus* (Cockerell) in Africa (Hemiptera, Coccoidea, Pseudococcidae). (In English; Summary In French). Bulletin de la Société Entomologique de France 106(3): 259-260. [WilliaMaMa2001]

Notes: This mealybug is recorded from the African continent for the first time. Earlier records from Africa have proved to be erroneous but the species has been reported from some neighbouring countries. Its presence in Réunion is reported for the first time. *P. lilacinus* is polyphagous and is common in southern Asia where it attacks fruit trees and is often important on coffee in southern India. A brief report is given on its economic importance.

Williams, M.L. 2001b (1999). Scale insect diversity in Central America, with emphasis on the soft scales (Hemiptera: Coccoidea). Entomologica 33: 225-227. [Willia2001b]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Central America, which includes Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, has provided a continuous land bridge for the mixing of the floras and faunas of North and South America for millions of years. Due to their complex geological and climatic histories, these countries have experienced repeated invasions and establishment of flora and fauna from both North and South America and have served as centres of speciation and biotic diversification. Today, this area boasts one of the highest diversities of insect species and yet little is known about the scale insects of this region. This paper represents a summary of the current understanding of soft scale insect diversity and distribution for these seven countries of Central America, from which only 20 genera and 56 species of Coccoidea are recorded.

Wu, S. 2001. The tribe Antoninini of China (Homoptera: Coccoidea: Pseudococcidae). Beijing Linye Daxue Xuebao 23(2): 43-48. [Wu2001]

Notes: This paper deals with the tribe Antoninini of China. Seven genera and 16 species were studied. Two species are new to science, and are described and illustrated. They are *Antonina hubeiana*, sp. nov. and *Nesticoccus fanjingensis*, sp. nov. The type specimens are deposited in Insect Collections, Beijing Forestry University.

Wu, S.A. 2000b. Descriptions of male and immature stages of *Cryptococcus ulmi* Tang et Hao (Homoptera: Coccoidea: Eriococcidae) with brief notes on its biology. (In English; Summary In Chinese). Entomotaxonomia 22(4): 251-256. [Wu2000b]

Notes: The crawler, second instar female and male, prepupa, pupa and adult male of *Cryptococcus ulmi* are described and illustrated for the first time, the adult female is redescribed, a key to all stages is given, and biological notes are provided.

Wu, S.A. & Zheng, L.Y. 2000. [*Sinococcus ulmi*, new genus and new species (Homoptera: Coccoidea) from China.] (In Chinese; Summary In English). Entomotaxonomia 22(3): 197-196. [WuZh2000]

Notes: A new genus is established and new species *Sinococcus ulmi* is described from Tianjin China. Recorded on *Ulmus pumila*.

Wu, S.A. & Zheng, L.Y. 2001. [A preliminary study of Chinese species of the genus *Formicococcus* Takahashi (Homoptera: Coccoidea: Pseudococcidae).] (In Chinese; Summary In English). Acta Zootaxonomica Sinica 26(2): 204-205 [WuZh2001]

Notes: *Formicococcus yanglingensis* new sp., *F. gasteris* and *F. speciosus* are described or reviewed. A key to Chinese species of *Formicococcus* is provided.

Wu, S.A., Yu, W.C., Wu, S.A. & Yu, W.C. 2000. [A study on *Physokermes shanxiensis* Tang (Homoptera: Coccoidea: Coccoidae).] (In Chinese; Summary In English). Scientia Silvae Sinicae 36(2): 98-102. [WuYuWu2000]

Notes: *Physokermes shanxiensis* is a newly found scale pest of ornamental plants in China. In recent years it has caused serious damage to *Picea meyeri* in the central part of Shanxi Province, China. In this paper, its hosts, distribution and damage to *Picea meyeri* are reported. The morphology of immature stages is described and observations made on its bionomics. The scale develops one generation a year in Taigu County, Shanxi Province, and overwinters on 1-year-old

twigs and needles in the second nymphal stage. Adult females and males emerge in early and late April, respectively, and the peak feeding/damaging period is from early April to mid-May. Each female lays 15-1143 eggs, 602.3 on an average. Natural enemies include *Harmonia oxyridis* [*H. axyridis*] and *Adalia bipunctata*, with the former more important. Control measures are proposed.

Xie, Y.P. & Zheng, L.Y. 2001. [Ultra-morphology and infrared absorption spectra of the waxes secreted by a scale insect, *Eulecanium gigantea* (Homoptera: Coccidae).] (In Chinese; Summary In English). *Acta Entomologica Sinica* 44(4): 408-415. [XieZh2001]

Notes: The ultra-morphology and chemical composition of the waxes secreted by the scale insect, *Eulecanium gigantea*, in different stages were studied with scanning electron microscope and infrared spectra techniques. The results showed that waxes secreted by the young nymph were wet. The first coagulated into many granular structures in different sizes, then linked into greater pieces and plates, finally heaped up into a turtle-shell-form wax covering the dorsal surface of the scale insect. Each plate of the wax covering corresponded in osition with the projecting integument area, on which the wax pores are densely distributed. In the young stage, the wax coverings possessed the equal texture for both sexes. However, the adult female secreted many long, coil and hollow wax threads. The infrared absorption spectra of waxes indicated that for the female adult stage, the wax secretions were of the same chemical functional groups and compositions, no matter whether they were secreted from dorsal or ventral surface. In spite of the basic similarity in chemical compositions of the waxes secreted by the female and the male, some significant differences were found. In the male's infrared spectra there were two peaks around the site of vibration frequency 1,736.3 cm⁻¹, but only one peak at the same site for the female's. Furthermore, in the male's spectra, there were 3 peaks in the vibration frequencies 1,242.0 cm⁻¹ ~ 1,106.6cm⁻¹ for the functional group C-O absorbing vibration. However, in the same frequencies, there was a series of saw-tooth-form peaks showing long carbon chain -C-C-C- absorbing vibration in the female's spectra. Based on the infrared spectra, it was suggested that the scale insect's waxes be composed most by long-chain hydrocarbons, fatty alcohols, fatty acids and some compounds with aromatic rings.

Xie, Y.P., Zhao, J.L., Guo, Y.P., Li, Y.F., Zhang, H.J. & Guo, Y.Q. 2001 (1999). The biology of *Phenacoccus azaleae* Kuwana, a pest of bunge prickly ash (*Zanthoxylum bungeanum* Maxim) in northern China. *Entomologica* 33(1999): 377-382. [XieZhGu2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] *Phenacoccus azaleae* Kuwana (Hemiptera: Coccoidea: Pseudococcidae) is a major new pest of bunge prickly ash forest in northern China, where it causes high tree mortality when present for two consecutive years. This paper reports on the biology of this pest in northern China, where it has been studied since 1995. The life cycle can be divided into eight phases, two of which cause severe injury to the host plant, through the feeding of: (a) the 3rd-instar nymphs and adult females between late March and mid-May, and (b) the young nymphs which are present on the leaves between late June and October. The adult sex ratio was 6-7:1♀. The various development stages are described. Of the natural enemies, ladybirds (Coccinellidae) and lacewings (Neuroptera) were the major predators, but they were not abundant in the newly-infested areas. In addition, a few parasitic Hymenoptera were recorded but appeared to be ineffective.

Xu, Z.H. & Chen, H.L. 2000. [Six new species of the genus *Microterys* of China (Hymenoptera: Encyrtidae).] (In Chinese; Summary In English). *Entomologia Sinica* 7(2): 97-106. [XuCh2000]

Notes: This paper deals with six new species of the genus *Microterys*, collected from Zhejiang, Fujian, Yunnan and Guangdong Provinces. Hosts for these species include *Metaceronema japonica* on *Camellia oleosa*, *Cerococcus muratae* on *Magnolia officinalis*, *Coccus hesperidum* on citrus, *Ceroplastes japonicus* on citrus, *Chloropulvinaria aurantii*, *Laccifer lacca*, *Ceroplastes japonicus* and *Kerria lacca* (Homoptera: Coccoidea).

Xue, J.L., Xie, Y.P., Liu, H.X., Liu, J.Q. & Li, Y.F. 2001 (1999). The effect of air pollution on *Sophora japonica* (Leguminosae) and *Eulecanium giganteum* (Shinji) (Hemiptera: Coccoidea: Coccidae) in urban areas in China. *Entomologica* 33(1999): 383-388. [XueXiLi2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] A study was made of the effect of two air pollutants (sulphur dioxide and

lead) on the pest status of the soft scale *Eulecanium giganteum* (Shinji) and on the accumulation of sulphur and lead in the scale's host tree, *Sophora japonica*, in three cities in China, namely Taiyuan, Yuci and Taigu. *E. giganteum* is a major pest of several tree species in many cities in China where air pollution can be high. This study showed a positive correlation between the level of the pollutants in the trees and the populations of the scale. The leaves absorbed and accumulated a greater amount of sulphur dioxide (SO₂ - as sulphur) and lead (Pb) than the twigs, but the trends were the same in each, namely with high levels in these tissues in the spring and early autumn. It is concluded that *E. giganteum* can withstand high levels of pollutants, both within the host plant and in the environment, whereas its natural enemies may not.

Yalemar, J.A., Hara, A.H., Saul, S.H., Jang, E.B. & Hoy, J.H. 2001. Effects of gamma irradiation on the life stages of yellow flower thrips, *Frankliniella schultzei* (Trybom) (Thysanoptera: Thripidae). Annals of Applied Biology 138(3): 263-268. [YalemaHaSa2001]

Notes: Irradiation at a minimum absorbed dose of 250 Grays (Gy) has been approved by the USDA as a quarantine treatment for certain fruits in Hawaii to control four species of tephritid fruit flies. Subsequent research must determine whether this dose is sufficient to control other quarantine pests, such as mealybugs, thrips, mites, beetles, moths, and scale insects, on other commodities with export potential that are approved for irradiation treatment for fruit flies.

Yamaguchi, T., Kiritani, K., Matsuhira, K. & Fukuda, K. 2001. [The influence of unusual hot weather on the occurrence of several arthropod crop pests.] (In Japanese; Summary In English). Japanese Journal of Applied Entomology and Zoology 45(1): 1-7. [YamaguKiMa2001]

Notes: To predict the effect of global climatic changes on insects, we examined the effects of a rise in temperature of 2-3°C on the phenology and occurrence of arthropod crop pests using data obtained from Kagoshima Prefecture, southwestern Japan, in 1998. The average temperature of this year was 2°C higher than that between 1960 and 1998. Several arthropod species (*Homona magnanima*, *Adoxophyes honmai*, *Scirtothrips dorsalis*, *Pseudaulacaspis pentagona*, aphids (mainly *Myzus persicae* and *Lipaphis erysimi*), and *Tetranychus kanzawai*) emerged earlier than in the previous years because of the unusually high average temperature. All species showed developmental zeros of less than 10°C. A possible increase in the number of generations per year was not clearly shown by the trap capture records, but all species were likely to have 1-2 more generations. We conclude that an elevation in mean temperature of 2°C would impact upon the phenology of insects, but the pattern of response would vary greatly among species.

Yamaguchi, T., Nojima, H., Omatsu, N., Torigoe, H. & Kawai, S. 2000. Scale insects collected in a mango (*Mangifera indica*) orchard on the Amami Islands [Japan]. (In Japanese). Proceedings of the Association of Plant Protection (Kyushu) 46: 132-135. [YamaguNoOm2000]

Notes: Coccidae, Pseudococcidae and Diaspididae are discussed in this paper.

Yang, S.Y., Yang, W.Y., Li, Z.G. & Zhao, Y.H. 2001. [Utility and prospects for *Opuntia ficus-indica*.] (In Chinese; Summary In English). Forest Research 14(1): 85-89. [YangYaLi2001]

Notes: *Opuntia ficus-indica* is an economic plant widely used as a fruit, vegetable, medicine and feed. It can be also used to revegetate barren hills, prevent water and soil erosion, and improve the ecological environment and the landscape, and is a good host for *Dactylopius coccus* (the cochineal producing insect). It is difficult to use various other species to afforest hot-dry or semi-hot-dry valleys such as those of the Jinshajiang River, the Lancangjiang River, the Nujiang River and the Yuanjiang River, because of the high mountains, steep slopes and stony soils. If *Opuntia ficus-indica* is selected for 'afforesting' these regions, it could not only prevent water and soil erosion, but also bring about obvious ecological, economic and social benefits. The paper discusses the utilization and prospects of *Opuntia ficus-indica* in western China.

Yanovskii, Y.P. 2001. [The resistance of apple to San Jose scale.] (In Russian). Sadovodstvo i Vinogradarstvo No. 1: 13-14. [Yanovs2001]

Notes: Studies were carried out during 1993-99 in the central forest steppe zone of the Ukraine on the resistance of 47 apple cultivars to San Jose scale [*Diaspidiotus perniciosus*]. Generally, young trees were more resistant than old trees.

Resistance varied between cultivars, with 100% resistance found in cultivars Rosavka, Sapphire, and Kiev Winter. A study on the development of the scale on cv. Rosavka showed a high natural resistance of this cv. to the scale.

Yasnosh, V.A. 2001 (1999). Observations on some mealybugs (Coccinea: Pseudococcidae) and their natural enemies on arborate plants in the Republic of Georgia. *Entomologica* 33(1999): 435-440. [Yasnosh2001]

Notes: [Special Issue: Proceedings of the ISSIS VIII International Symposium on Scale Insect Studies held at Wye College (U.K.), Aug. 31st - Sept. 6th, 1998.] Twenty-one species of Pseudococcidae are associated with woody plants in Georgia. About 50% are adventive species that are mostly restricted to the subtropical zone of the Black Sea, although *Pseudococcus comstocki* (Kuwana) and *Planococcus ficus* (Signoret) are widespread, while the main pest is *Planococcus ficus*, which is injurious to grapevine and some other plants. The indigenous species are related to other European or Euro-central Asian species. Three species have been described from Georgia, but native mealybugs are of no economic importance and are rarely found in urban areas. The main biocontrol agents for most of these mealybugs are encyrtid wasps (Hymenoptera: Chalcidoidea). The species described from Georgia which may be effective biocontrol agents are: *Aphytis hadzibeyliae* Trjapitzin, a parasitoid of *Phenacoccus aceris* (Signoret) and *Phenacoccus transcaucasicus* Hadzibeyli, and *Pseudaphycus phenacocci* Jasnosh, also a parasitoid of *P. aceris* (as *P. mespili* (Signoret)). A revised check-list of the mealybugs and their parasitoids in Georgia is given.

Yoder, J.A. & Houck, M.A. 2001. Xeric survival without drinking by hypopodes of *Hemisarcoptes cooremani* (Acari: Hemisarcopidae). *International Journal of Acarology* 27(1): 59-62. [YoderHo2001]

Notes: *Hemisarcoptes cooremani* (Thomas) (Acari: Hemisarcopidae) is native to the southern United States, from California to Florida. Parasitic stages of the mite's life cycle (i.e. larvae, protonymphs, tritonymphs and adults) have been used for the biological control of diaspidid scale insects which infest perennial vascular crops. A heteromorphic dispersal stage (hypopode) differs from all other stages in the life cycle in that it is well sclerotized. All other stages are relatively soft-bodied and sheltered from desiccation by the cap (and velum) of their invaded diaspidid prey. The hypopode lacks an oral cavity and foregut and is therefore prevented from imbibing water, as water becomes available from the environment, and as it awaits the arrival of its phoretic dispersal host (*Chilocorus cacti*). A water balance profile was constructed on the hypopode of *H. cooremani* to better understand how this stage survives extended periods of water stress in hot dry climates. A high dehydration tolerance was not apparent. The major survival element in dry environments appears to be water retention (low net water loss rate) and a small water pool. The high critical transition temperature and suppressed activation energies for water loss suggest that the enhanced water conservation is due, in part, to the sclerotized cuticular armor, particular to this stage in the life cycle.

Yokoyama, V.Y., Miller, G.T. & Crisosto, C.H. 2001. Pest response in packed table grapes to low temperature storage combined with slow-release sulfur dioxide pads in basic and large-scale tests. *Journal of Economic Entomology* 94(4): 984-988. [YokoyaMiCr2001]

Notes: The effect of low temperature storage combined with slow release sulfur dioxide pads was determined in basic laboratory and large-scale commercial tests on western flower thrips, *Frankliniella occidentalis* Pergande; grape mealybug, *Pseudococcus maritimus* (Ehrhorn); Pacific spider mite, *Tetranychus pacificus* McGregor; two-spotted spider mite, *Tetranychus urticae* Koch; and omnivorous leafroller, *Platynota stultana* Walshingham. Temperatures within the foam containers among the packed clusters decreased from ambient to 2 degreesC within approximately 1 d and ranged from 0.4 to 1.7 degreesC in all tests. Sulfur dioxide concentrations in the foam containers ranged between 0.2 and 1.6 ppm during the 1- to 6-wk storage period in basic tests and 0.5-1.1 ppm during the 1- to 8-wk storage period in the large-scale test. Western flower thrips was completely controlled by a :1-wk exposure. Grape mealybug mortality was greater than or equal to 93% after 2-5 wk exposures and 100% after a 6-wk exposure in basic tests. Mortality of grape mealybug and two-spotted spider mite increased significantly at greater than or equal to 3-wk exposures and Pacific spider mite mortality increased significantly at greater than or equal to 4-wk exposures. The treatment resulted in <8% survival of grape mealybug and <1% survival of Pacific spider mite in the large-scale test. The combination treatment offers an economical method to attain quarantine control of certain insects and mites.

Zaher, M.A., El Boroassy, M.A. & Ali, F.S. 2001. Morphological and biological studies on *Typhlodromus talbii* Athias-Henriot (Gamasida: Phytoseiidae). (In English; Summary In French). Insect Science and its Application 21(1): 43-53. [ZaherElAl2001]

Notes: The immature stages of the predaceous mite *Typhlodromus talbii* [*Paraseiulus talbii*] are described. The mite was reared on different prey species and pollen in the laboratory, and its developmental parameters calculated. *Tydeus californicus* [*Orthotydeus californicus*] was found to be the most suitable and nourishing diet, giving a shorter life cycle and higher female fecundity (8.8 days and 33.4 eggs, respectively), than the scale insect *Coccus acuminatus* [*Kilifia acuminata*] (10.0 days and 24.8 eggs, respectively) at 25°C. Other associates of *Typhlodromus talbii*, the eriophyid *Cesaberoptus kenyae* [*Cisaberoptus kenyae*], the tetranychid *Oligonychus mangiferus*, as well as date palm (*Phoenix dactylifera*) and castor oil (*Ricinus communis*) pollen, were unsuitable diet. When reared on moving stages of *Tydeus californicus* at 70±5% RH, 16:8 (L:D) h photoperiod and temperatures of 15, 20, 25, 28, 30, 32 and 35°C, the total developmental time of *Typhlodromus talbii* averaged 21.3, 12.4, 8.8, 7.6, 7.1, 5.8 and 11.6 days, respectively. The intrinsic rate of natural increase and the net reproduction reached maximum values of 0.299 individuals per female per day and 28.06 times, respectively, at 32°C.

Zalom, F.G., Van Steenwyk, R.A., Bentley, W.J., Coviello, R.L., Rice, R.E., Hendricks, L., Pickel, C. & Freeman, M.W. 2001. Pests of almond. UC Pest Management Guidelines [ZalomVaBe2001]

Notes: [http://www.ipm.ucdavis.edu/PMG/selectnewpest.almonds.html] This update to the University of California IPM Pest Management Guidelines contains descriptions and control recommendations for insects, arthropod and nematode diseases of almond in the U.S., including *Parthenolecanium corni* and *Quadraspidiotus perniciosus*.

Zeddies, J., Schaab, R.P., Neuenschwander, P. & Herren, H.R. 2001. Economics of biological control of cassava mealybug in Africa. Agricultural Economics (Amsterdam) 24(2): 209-219. [ZeddieScNe2001]

Notes: Pest populations of the cassava mealybug, *Phenacoccus manihoti*, (Homoptera: Pseudococcidae) were reduced successfully by the biological control agent *Apoanagyrus (Epidinocarsis) lopezi* De Santis (Hymenoptera: Encyrtidae) throughout most of sub-Saharan Africa. The economics of the project were evaluated based on data from field trials, socio-economic surveys, published results, and financial information provided by the International Institute of Tropical Agriculture (IITA) and the national programmes. Costs and benefits for the biological control of *P. manihoti* were calculated over 40 years (1974-2013) for 27 African countries, for four different scenarios, taking into account that impact by *A. lopezi* and speed of the impact differ between ecological zones. A reasonable calculation considering compounded interest resulted in a benefit/cost ratio of about 200 when cassava was costed at world market prices, and of about 370-740 when inter-African prices were considered.

Zeng, T. 2001. [A new species and two new record species of the genus *Neoquernaspis* from China (Homoptera: Coccoidea: Diaspididae).] (In Chinese; Summary In English). Acta Zootaxonomica Sinica 26(4): 528-532. [Zeng2001]

Notes: *Neoquernaspis leptosiphia*, new sp., is described and illustrated. *N. beshearae* and *N. nepalensis* are new records to China. A key to Chinese species of this genus is provided.

Zhang, X.L. 2000. [The extra effective insecticides for control of pomelo scales.] (In Chinese). South China Fruits 29(6): 23. [Zhang2000]

Notes: *Icerya purchasi* and circular black scale (*Chrysomphalus aonidum*) are the two important scales for Guangximiyu pomelo [pummelo] variety and they can badly affect fruit quality. Spraying 200-250 times solution of mechanical oil emulsion + 800-1000 times solution of 40% Supurocide in mid May controlled these scales well. In addition, red mite and rust mite were killed as well. The treatment was effective for 25 days.

Zhang, Y.Z. & Huang, D.W. 2001. A new genus and a new species of Encyrtidae (Hymenoptera: Chalcidoidea) from China. Raffles Bulletin of Zoology 49(2): 199-201. [ZhangHu2001]

Notes: A new genus of Encyrtidae, *Profundiscrobiis*, is described with type-species *Profundiscrobiis flagelliformis* from Beijing, China. *Profundiscrobiis*, new genus, is close to *Tachardiaephaglis* Ashmead, Choreia Westwood because of similar interantennal prominence. The types are deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing.